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CHANGES IN THE COLOR OF THE INTRANASAL MUCOUS MEMBRANE

AS A GUIDE TO THE STATUS OF THE SYMPATHETIC AND OF THE PARASYMPATHETIC SYSTEM

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INTRODUCTION

For some time one has had access to and has been more or less familiar with facts relating to the autonomic nervous system. The difficulty has been in applying these well known facts clinically. The reason for this difficulty has been the lack of a suitable index enabling one to determine whether the sympathetic or the parasympathetic is dominant, or whether one is dealing with a mixed type in which the sympathetic is dominant for a brief period of time to be followed by a brief period in which the parasympathetic is dominant.

The importance of such an index is appreciated when it is realized that these three types—sympathetic, parasympathetic and mixed type—represent three constitutional types which are subject to artificial control by the physician through a suitable index rather than spontaneous control by nature. Each one of these three constitutional types has associated clinical conditions which often disappear when artificial change in constitutional type is brought about. At this time I wish to present changes in the color of the mucous membrane as an index to the autonomic level, more especially changes in the color of the intranasal mucous membrane, particularly of that covering the cartilaginous portion of the nasal septum. Clinical experience has shown that the mucous membrane in this location is more sensitive to changes in the autonomic level than the mucous membrane elsewhere in the upper respiratory tract. By autonomic level I mean the constant tug taking place between sympathetic control, on one hand, and parasympathetic control, on the other.

CHARACTERISTICS OF THE SYMPATHETIC DIVISION

Turning to the characteristics of the sympathetic division as presented in textbooks and the literature, one notes, as one reads, that extensiveness of distribution of the fibers of the sympathetic division is one of its most prominent characteristics.

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Both from anatomic and physiologic evidence the neuron relations in the sympathetic division seem devised for widespread diffusion of nervous impulses. Among the many actions of the sympathetic may be mentioned: (1) dilating the pupil, (2) decreasing the secretion of saliva, (3) increasing the heart action, (4) keeping the smooth muscle of the walls of blood vessels in a state of slight contraction or tone, (5) stimulating the sweat glands, which results in the outpouring of sweat, (6) inhibiting digestive activity, (7) contracting the smooth muscle of the genito-urinary tract and (8) releasing material stored in the liver, which serves the body in time of great need.

CHARACTERISTICS OF THE PARASYMPATHETIC DIVISION

Considering the characteristics of the parasympathetic division as likewise presented, one notes as one reads that in contrast to the sympathetic division, the parasympathetic has a restricted distribution. The cranial division which is distributed to the lungs, heart, stomach and small intestine is a conserver of body resources. By narrowing the pupil of the eye the retina is shielded from excessive light. By slowing the heart the cardiac muscle is given longer periods for rest and recuperation. By providing for the flow of saliva and gastric juice and by supplying the muscular tone necessary for contraction of the alimentary canal the process of digestion and absorption, by which energy-yielding material is taken into the body and stored, is improved. To the cranial division of the visceral nerves, therefore, belongs the quiet service of building up reserves and fortifying the body against the time of need and stress.

The fibers of the sacral division cause contraction of the distal part of the colon and rectum and relax the neck of the bladder. Like the cranial division, the sacral is engaged in internal service to the body, in the performance of acts leading immediately to greater comfort of the body. Among the characteristic actions of the parasympathetic may be mentioned: (1) contracting of the pupil, (2) increasing the salivary secretion, (3) decreasing the heart action, (4) dilating the walls of blood vessels, (5) accelerating intestinal activity and (6) relaxing the neck of the bladder.

ANTAGONISM OF SYMPATHETIC DIVISION AND PARASYMPATHETIC DIVISION

From the characteristics of the sympathetic and parasympathetic one notes that they are antagonistic one to the other. By means of the general diffuse action of the sympathetic and the opposite particular action of the parasympathetic every variety of change is provided for. All the viscera may be affected simultaneously in one way or the other through

increased or decreased tone of the sympathetic division, and any special organ can be separately affected one way or the other through increased or decreased tone in the special nerve of the opposed cranial or sacral division that is supplied directly to the organ.

Cannon has well expressed the behavior of the autonomic nervous system by stating that the sympathetic is like the soft and loud pedals of a piano which modulate all the keys at one time, while the cranial and sacral divisions are like the fingers of the player which control separate keys.

The sympathetic division being antagonistic to the parasympathetic division, their effects in any organ of the body are characteristically opposite. Thus the parasympathetic supply to the eye contracts the pupil, while the sympathetic dilates it. The parasympathetic slows the heart, while the sympathetic accelerates it. The parasympathetic contracts the lower part of the large intestine, while the sympathetic relaxes it. The parasympathetic relaxes the exit from the bladder, while the sympathetic contracts it.

CHANGES IN THE COLOR OF THE MUCOUS MEMBRANE

With the characteristics of these two divisions of the autonomic nervous system in mind, one may turn to a consideration of changes in the color of the intranasal mucous membrane, more especially that portion covering the cartilaginous portion of the nasal septum, for clinical experience has shown that mucous membrane in this location is more sensitive to changes in the autonomic level than mucous membrane elsewhere in the upper respiratory tract.

Continued observation of the intranasal mucous membrane discloses two facts: First, different persons may show a difference in color. Second, a person may show a difference in color at subsequent examinations. This color may be one of three shades of red, ranging from pink and dark red to a crimson color, or it may be one of three shades of pallor, ranging from pale to almost paper white. There is a third type called the mixed type in which the mucous membrane may be pale on one side of the nasal septum and red on the other, or both sides may show a pale pink. By pale pink I mean that a mucous membrance, while showing a delicate pink, also carries with it a suggestion of an underlying pallor. For the purpose of the record, the three shades of red have been designated + 1, + 2 and + 3. Plus 3 represents a crimson type of redness. The corresponding three shades of pallor have been designated by — 1, — 2 and — 3. Minus 3 represents an almost paper white mucous membrane. The pale pink mucous membrane has been designated plus minus.

At the April 1934 annual meeting of the American Laryngological, Rhinological and Otological Society held at Charleston, S. C., Dr. Ira Frank of Chicago, in discussing the symposium on the subject, "Newer Clinical Approaches in Otolaryngology," suggested the use of the Tallqvist hemoglobin scale as a means of recording changes in the color of the intranasal mucous membrane. On my return home I studied the Tallqvist hemoglobin scale in a darkened room by means of a head mirror and reflected light and noted that a + 3 degree of redness corresponded to 80 on the Tallqvist scale, a + 2 degree of redness corresponded to 40, a + 1 degree of redness to 20, and a pale pink to 10. For the purpose of the record, the different shades of a red mucous membrane may be recorded as Tallqvist + 80, + 40, + 20 or + 10, as the case may be. The corresponding degrees of pallor may be recorded by using the minus sign with these same numbers, — 80 representing an almost paper white color of the mucous membrane of the nasal septum. Clinical experience has shown that the mucous membrane covering the anterior third of the inferior turbinate is generally one shade less in color than the cartilaginous portion of the nasal septum.

SYNDROME OF THE RED MUCOUS MEMBRANE

As one has contact with the patient showing a marked increase in redness of the nasal septum and listens to his clinical story, one notes that he complains of being tired all the time. Everything he does ends in more fatigue. He is tired in the morning, tired at noon and tired at night. The day's work instead of being a joy to him represents a round of duties to be gone through with. He is irritable when he does not wish to be. He is a bit hard to live with, although that is his least desire. He goes about with a hair-trigger type of temperament and is easily offended by others. During the middle of the day when he should be most awake, he is drowsy. When bedtime arrives and he should feel sleepy, he is wide awake and at his best. His night's sleep brings him only a moderate amount of refreshment, and he comes to the beginning of the day's work as a rule a bit tired. He is body conscious, having indefinite symptoms of short duration in various parts of the body. He is subject to constipation. His skin is inclined to feel dry. His hair comes out a bit more than he wishes. All in all he feels that a long vacation of some sort is necessary before he can possibly feel right again.

SYNDROME OF THE PALE MUCOUS MEMBRANE

As one has contact with the patient showing a corresponding degree of pallor of the mucous membrane of the nasal septum and listens to his clinical story, one notes that he is annoyed by an itching skin. This itching ranges from that calling for an occasional scratching of the skin

to that necessitating retiring from time to time when guests are entertained in order that a thorough scratching of the body surface may be given. An itching nose is often a great source of annoyance. A headache posterior to or just above the eyebrows is often present. This may range from a feeling of mild discomfort in the region of the eyebrows to a so-called "sick headache."

SYNDROME OF THE MIXED TYPE OF MUCOUS MEMBRANE

As one has contact with the patient showing pallor on one side of the nasal septum and redness on the other or a pale pink mucous membrane on both sides and listens to his clinical story, one notes that he presents continuously neither the syndrome of the red mucous membrane nor that of the pale mucous membrane. He is at times representative of one and at other times representative of the other. He has periods of physical depression which alternate with periods of increased physical activity.

CLINICAL DATA PRESENTED BY THE PATIENT WITH THE RED MUCOUS MEMBRANE

As one examines the patient with a red mucous membrane, one often gathers the following data: 1. Tachycardia is present invariably in both the resting and the active states. 2. The gastro-intestinal tract is atonic. 3. There is peripheral ischemia. 4. There is excessive cold perspiration. 5. There is constant fatigue. 6. Reactiveness is at a low ebb. 7. There is no tendency to pile up reserve energy. 8. The trend of the energy balance is in the direction of catabolism.

CLINICAL DATA PRESENTED BY THE PATIENT WITH A PALE MUCOUS MEMBRANE

When a patient with a pale mucous membrane is examined, one often gathers the following data: 1. Reactiveness is excessive. 2. There is an ability to pile up excessive amounts of reserve energy. 3. The trend of the energy balance is in the direction of anabolism. 4. The descending colon is spastic. 5. The pulse is slow. 6. The skin is usually ruddy.

CLINICAL DATA PRESENTED BY THE PATIENT WITH A MIXED MUCOUS MEMBRANE

As one examines the patient with mucous membrane of the pale pink or mixed type, one notes the following facts: 1. The patient is neither continuously sympathetic nor continuously parasympathetic. 2. He almost invariably has a spastic descending colon. 3. He is very apt to have, but not necessarily, a slow pulse. 4. His skin is usually ruddy,

but when he is under nervous tension, it generally loses color. 5. He is apt to have migraine. 6. Constipation of the spastic type with small desiccated stools occurs frequently. 7. There may be a calm exterior, but underneath it is a very tense person. 8. He is ruddy and well nourished. 9. The body weight accumulates easily, probably by water-logging.

DIAGNOSIS MOST OFTEN ASSOCIATED WITH RED MUCOUS MEMBRANE

As to the diagnosis most often arrived at in studying patients with red mucous membrane one notes: (1) clinical conditions characterized by infection, (2) hyperthyroidism, (3) atrophic arthritis, (4) diabetes mellitus, (5) cancer and (6) hypertension of the vascular system.

DIAGNOSIS MOST OFTEN ASSOCIATED WITH PALE MUCOUS MEMBRANE

In studying persons with pale mucous membrane, the diagnoses most often arrived at are: (1) asthma, (2) hay fever, (3) urticaria, (4) eczema, (5) other allergic diseases, (6) hypothyroidism and (7) hypotension of the vascular system.

DIAGNOSIS MOST OFTEN ASSOCIATED WITH THE MIXED TYPE OF MUCOUS MEMBRANE

In regard to the mixed type of mucous membrane one finds, as one naturally expects, that the diagnosis includes conditions from both the red mucous membrane group and the pale mucous membrane group, depending on in which direction the patient has shifted at the time he has contact with his physician. The patients often give a history of infections and allergic diseases, but on closer study one notes that as a rule infection and allergy were not present at the same time.

DOMINANT SYMPATHETIC AND RED MUCOUS MEMBRANE

From the foregoing observations one would expect a person with a dominant sympathetic and a subdominant parasympathetic to present: (1) a dilated pupil, (2) decreased salivary secretion, (3) increased heart action, (4) hypertension of the vascular system, (5) stimulation of the sweat glands and (6) disturbed digestive function.

As persons showing an increased redness of mucous membrane are examined one finds that they have: (1) a dilated pupil, which is most often 5 mm. or over in size; (2) decreased salivary secretion, the saliva being scanty, ropy and stringy; (3) increased heart action, the rate in the resting state being generally above 75; (4) hypertension of the vascular system, the systolic pressure being generally above 120; (5) stimulation of the sweat glands, there being excessive cold perspiration; (6) disturbed digestive function, the gastro-intestinal tract being atonic, and (7) a temperature generally of 99 F.

From a comparison of the characteristics of a dominant sympathetic with the characteristics of a person showing an increased redness of the mucous membrane covering the cartilaginous portion of the nasal septum it seems reasonable to conclude that the degree of this redness may be considered an index to the status of the sympathetic division of the autonomic nervous system.

DOMINANT PARASYMPATHETIC AND PALE MUCOUS MEMBRANE

One expects a person with a dominant parasympathetic and a subdominant sympathetic to present: (1) a contracted pupil, (2) increased salivary secretion, (3) decreased heart action and (4) hypotension of the vascular system.

One finds as persons showing pallor of mucous membrane are examined that they have: (1) a contracted pupil, which is most often 5 mm. or under in size; (2) increased salivary secretion, the saliva being profuse and watery; (3) decreased heart action, the rate in the resting state being generally under 75; (4) hypotension of the vascular system, the systolic pressure being generally below 120; (5) a temperature of 98 F. or below, often between 97 and 98 F.

From a comparison of the characteristics of a dominant parasympathetic with the characteristics of a person showing pallor of the mucous membrane covering the cartilaginous portion of the nasal septum it seems reasonable to conclude that the degree of pallor may be considered an index to the status of the parasympathetic division of the autonomic nervous system.

THREE CONSTITUTIONAL TYPES

From the foregoing observations one concludes that there are three constitutional types: the sympathetic, the parasympathetic and the mixed type. These three types often represent family patterns which are followed by children of the family. Each type manifests itself in a definite color of the mucous membrane. Each type has associated clinical conditions. Artificial change of the constitutional type often carries with it a disappearance of the associated clinical condition.

FOUNDATION ON WHICH THESE THREE CONSTITUTIONAL TYPES REST

Continued clinical experience tends to lead one to suspect that these three constitutional types rest on the reaction of the catabolic and anabolic sets of endocrine glands to the pressure of the environment in which the patient finds himself. Of the factors exerting the greatest influence, the selection of food which he makes from his environment appears to be most important. In this selection of food, the mineral content is of first importance, the iodine and chloride content being most important. Second in importance is the amount of carbohydrate the food

selected contains, especially refined carbohydrate. Third in importance is the water balance of the body influenced by the sodium and calcium content of the food selected.

Clinical experience discloses the fact that an increased intake of chloride, whether in the form of sodium chloride, ammonium chloride or dilute hydrochloric acid, will increase the degree of redness of the mucous membrane or change a pale mucous membrane to pink. On the other hand, iodine, especially organic iodine, will bring about a decrease in the degree of redness of the mucous membrane or change a pink mucous membrane to pale. It requires months to change a red mucous membrane to pale while a pale mucous membrane can be changed to red in a few weeks. From this, one concludes that it is easier to stimulate the sympathetic division than it is to depress it. From the behavior of intranasal mucous membrane under treatment with iodine and chloride it is felt that a chloride iodine balance exists.

The prescription of iodine or chloride, depending on whether the mucous membrane of the nasal septum is red or pale, is in keeping with well known chemical laws. There are two laws of chemistry that appear to work as well inside the body as outside of it. The first is that of halogen displacement, and the second is that of unsaturated fatty acids and hydrocarbonates. When a chloride is taken into the body, the iodine which has been held in combination in the endocrine glands and tissues is thrown into the blood stream as hydriodic acid and iodine. The free iodine is in loose combination with lipoids. This is taken to the liver where desaturation occurs. The fat is taken up by the storehouses of the body. The iodine goes into the bile and drains into the intestines, where one of two things may happen: If an unsaturated fatty acid is present in the intestine, it may be reabsorbed. If there is a large amount of waste and bacteria in the intestine, these seize the iodine and it is excreted from the body. This explanation is borne out by the fact that the iodine in the blood is increased above normal in some of the clinical conditions associated with increased redness of the intranasal mucous membrane, such as hyperthyroidism and diabetes mellitus.

There is another balance that bears a close relationship to the behavior of the autonomic nervous system, and that is the carbohydrate chlorophyll balance. An intake of refined carbohydrate without a corresponding intake of chlorophyll increases the degree of redness of the intranasal mucous membrane and results in a dominant sympathetic system.

TREATMENT WHEN THE MUCOUS MEMBRANE IS RED

If the mucous membrane covering the cartilaginous portion of the nasal septum shows a marked increase in redness, the fact suggests a dominant sympathetic. With this fact in mind one determines (1)

whether the syndrome of the red mucous membrane is present; (2) whether the pupil, salivary secretion, pulse rate, blood pressure, temperature, and behavior of the gastro-intestinal tract reflect a dominant sympathetic. Having assured oneself that the mucous membrane color index is substantiated, one then knows that one has as a background to any clinical condition which may be present a definite constitutional type, which may be called the sympathetic type. To bring about artificial change of this constitutional type, a number of procedures are necessary: (1) It is essential to decrease the intake of sodium chloride and foods serving as a vehicle for carrying sodium chloride into the body, such as ham, bacon and the like. This means, in reality, decreasing the intake of acid ash foods, because acid ash foods when analyzed more at length require the addition of sodium chloride in their preparation for market or suggest the addition of sodium chloride to make them more pleasing to the taste. 2. It is necessary to decrease markedly the intake of refined carbohydrate and increase the intake of chlorophyll. I find this result best brought about by prescribing spinach tablets, which are marketed under the trade-name Spintrate. Four of these tablets equal a level teaspoonful of powdered spinach. By the use of spinach tablets a constant daily source of chlorophyll is assured. Four of these tablets are prescribed at one or all three meals of the day, depending on how great the need. 3. Clinical experience has shown that it is necessary to prescribe 1 teaspoonful of cod liver oil each day for its iodine and vitamin D content. The vitamin D it is felt, from clinical experience, is necessary for the pancreas to synthesize chlorophyll. Recent analysis of cod liver oil shows it to be a richer source of organic iodine than vegetables grown in South Carolina, the iodine state. 4. It will be noted, as the regimen is carried out, that the patient is forced to select a greater portion of his food from alkaline ash-producing foods. Because of this fact it is well at the outset to request him to select at each meal two foods ripened by the sun to one food not ripened by the sun. Alkaline ash-producing food is mostly food ripened by the sun as represented by fruits and vegetables, while acid ash-producing food is mostly food not ripened by the sun, such as eggs and meat. As one brings about an artificial change in constitutional type, often the associated clinical condition disappears, showing that suitable soil for its maintenance is no longer present. A study of the color of the mucous membrane covering the cartilaginous portion of the nasal septum is made from time to time in order to note progress and indications for a modification of the regimen outlined for the patient.

TREATMENT WHEN THE MUCOUS MEMBRANE IS PALE

If the mucous membrane covering the cartilaginous portion of the nasal septum shows pallor it suggests a dominant parasympathetic. With

this fact in mind one determines (1) whether the syndrome of the pale mucous membrane is present; (2) whether the pupil, salivary secretion, pulse rate, blood pressure, temperature and behavior of the gastro-intestinal tract reflect a dominant parasympathetic. Having assured oneself that the mucous membrane color index is substantiated, one then knows that one has as a background to any clinical condition which may be present a definite constitutional type, which may be called the parasympathetic type. To bring about artificial change of this constitutional type a number of procedures are necessary: 1. The intake of chloride must be increased by prescribing dilute hydrochloric acid to be taken at each meal. If necessary it may also be taken at bedtime. This is taken during the middle of the meal so that, food being taken afterward, the teeth are protected. The dosage of dilute hydrochloric acid ranges from 20 drops as a minimum to 50 drops as a maximum for each dose. 2. The intake of sodium chloride is to be increased by enlarging the intake of foods which require sodium chloride in their preparation for market or which suggest the addition of table salt in order to make them more pleasant to the taste. This is best carried out by suggesting to the patient that he select at each meal two foods not ripened by the sun to one food ripened by the sun. 3. The intake of carbohydrate is to be gradually increased, but not that of refined carbohydrate. Examination often shows a low blood sugar in clinical conditions associated with a pale mucous membrane. Maple syrup or honey should first be tried. 4. The intake of chlorophyll is to be decreased, which means the reduction of the intake of green-colored vegetables. 5. In case results fail to come when an increased intake of chloride in the form of dilute hydrochloric acid is prescribed to displace the stored iodine, it may mean that no iodine has been available for storage. Under circumstances such as this, iodine is prescribed to the point of saturation that it may be available for storage. In event of continued failure, gland substance itself is prescribed in the form of capsules of suprarenal cortex extract, thyroid extract tablets or a polyglandular preparation to relieve an apparent failure of gland function. A check-up of the color of the mucous membrane covering the cartilaginous portion of the nasal septum is made from time to time in order to note progress and make any necessary modification of the regimen outlined for the patient.

NORMAL COLOR OF THE MUCOUS MEMBRANE

The question may arise as to what represents the normal color of the mucous membrane. As a help in answering this question, consider the color of mucous membrane covering the cartilaginous portion of the nasal septum in the newly born infant.

Analysis.—The color of the nasal septum was studied in 106 new-born infants whose ages varied from 3 hours to 23 days, the average being 5.71 days. Pale mucous membrane designated as — 1 to — 4 was observed in 97 of 98 white babies; 51 of 52 males; 53 of 54 females; 95 of 97 breast-fed infants; 8 of 9 formula-fed infants, and 99 of 101 normally healthy babies, and pale mucous membrane of grades —1 to —3 in 4 of 5 babies whose condition was abnormal.[1]

The conclusion is that during the new-born period the color of the nasal septum of healthy white infants is pale.

The mucous membrane covering the cartilaginous portion of the nasal septum in new-born infants being generally pale, it should normally reach a pink color at maturity. A dominant sympathetic as revealed by an increased redness of the mucous membrane of the nasal septum is a departure from normal.

In closing this presentation I wish to acknowledge the assistance received from the many letters exchanged in a correspondence group of fifty nationally known medical men, the majority of whom are otolaryngologists, which I organized in May 1931 to discuss the relation of biochemistry to clinical conditions by means of a group correspondence represented by three group letters exchanged each week, fifty-two weeks in the year.

SUMMARY

1. A dominant sympathetic or a dominant parasympathetic is reflected in the color of the mucous membrane.

2. A red mucous membrane denotes a dominant sympathetic system.

3. A pale mucous membrane denotes a dominant parasympathetic system.

4. Mucous membrane covering the cartilaginous portion of the nasal septum is used because it records changes in the autonomic level more quickly.

5. Three mucous membrane color types point the way to three constitutional types: sympathetic, parasympathetic and mixed.

6. Each type has associated clinical conditions.

7. Artificial control of the constitutional type is of great assistance in treating clinical conditions.

8. Some form of iodine when mucous membrane is red and some form of chloride when mucous membrane is pale brings about the desired change.

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1. Dr. Stanley D. Giflen of Toledo, Ohio, prepared the analysis of the data on the color of the nasal septum in new-born infants.

OCULOMOTOR NERVE SPASM IN GRADENIGO'S SYNDROME

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In 1904 Gradenigo [1] described a triad of symptoms which has since been called Gradenigo's syndrome. It consists of acute otitis media, associated with pains in the head and paralysis of the sixth, or abducens, nerve, both of which occur on the same side as the aural condition. The pathologic condition of the ear may take the form of acute purulent otitis media or an exacerbation of chronic otitis without signs of mastoiditis, or the syndrome may occur during convalescence from an operation on the mastoid. The pains in the head, due to pressure on the gasserian ganglion, are as a rule severe, and may be occipital, temporoparietal, in or around the eye or referred to the teeth. As a result of the involvement of the sixth nerve (which, like that of the fifth nerve, is the effect of pressure exerted on the nerve by localized serous meningitis at the apex of the petrous pyramid), the patient complains of diplopia, and a paralytic internal strabismus develops. Numerous reports of cases in recent years have served to disprove the idea formerly held that the condition is extremely rare. Although the otologic problems of the syndrome have received adequate consideration, the ophthalmologic picture has not been fully presented in the literature.

It is interesting to review briefly the rôle that is played by the various oculocranial nerves in the Gradenigo syndrome. The sensory part of the fifth nerve and the sixth nerve, as already noted, are regularly involved. The other nerves (the second, third, fourth and seventh) are not affected as a rule except when further complications of the condition in the ear arise, such as sinus thrombosis, abscess of the brain or diffuse suppurative meningitis. Occasionally, however, a disturbance of any one of these nerves may appear, even though clinically there is no evidence of intracranical complication.

It is important, therefore, in the proper management of the case that the relative significance of such an event be fully appreciated. The finding of a choked disk, for instance, in the routine examination of the eye of a patient with Gradenigo's syndrome should not be regarded per se as an indication for surgical intervention, unless there is other well defined evidence of intradural involvement. This point was well

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1. Gradenigo, G.: Arch. f. Ohren-, Nasen- u. Kehlkopfh. **62**:255, 1904.

brought out recently by Lillie and Williams.[2] Similarly, the seventh, or facial, nerve may infrequently be involved in the syndrome and the condition may clear up spontaneously. John Miller [3] has recently reported such a case. The fourth, or trochlear, nerve, which supplies the superior oblique muscle and gives rise to vertical diplopia when affected, is the least frequently involved of all the oculocranial nerves.

The third, or oculomotor, nerve is likewise infrequently involved by pressure phenomena. The reason for this becomes apparent when one considers the short and comparatively sheltered course of the nerve at the base of the skull. It arises [4] from the medial surface of the cerebral peduncle and, piercing the dura in the middle cranial fossa, at once enters the lateral wall of the cavernous sinus. There it lies in close relation with the fourth nerve and the ophthalmic branch of the fifth. Thence it enters the orbit through the superior orbital fissure, splitting first into a superior and an inferior division.

It is my opinion that the third nerve, while relatively spared from pressure at the base of the skull, is rather frequently involved in Gradenigo's syndrome resulting in a spasm of the homolateral internal rectus muscle, which it innervates. The six eye muscles are normally in a delicately balanced state of tonicity, which is readily upset when any one of them becomes paralytic. The rectus internus, antagonist of the nonfunctioning rectus externus, at once assumes an increased tonicity which, if marked, develops into a spasm. This spasm is not seen in cases of paresis of the sixth nerve. In complete palsy of the abducens nerve spasm may make its appearance as early as the first week.

Little or no mention of oculomotor nerve spasm in Gradenigo's syndrome appears in the literature, and yet there must be many cases of complete paralysis of the sixth nerve in which spasm of the third nerve was present but unrecorded. These cases present a definite clinical picture and are worthy of description, because they provide a more complete understanding of the syndrome and because they may be confused with cases of bilateral involvement of the sixth nerve. Perhaps the reason for the omission lies in the fact that when the condition in the ear is suddenly complicated by paralysis of the sixth nerve the examiner finds himself preoccupied with the otologic problem to the exclusion of the details of the ophthalmologic picture.

What is the clinical picture of this spasm? First, it will be readily noted that as the patient looks directly ahead (primary position of the eyes) the paralytic eye turns toward the nose; i. e., internal strabismus

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2. Lillie, H. I., and Williams, H. L.: Suppuration of the Petrous Pyramid, Arch. Otolaryng. **15**:692 (May) 1932.

3. Miller, J.: Ann. Otol., Rhin. & Laryng. **40**:88, 1931.

4. Cunningham, A. G.: Manual of Practical Anatomy, ed. 6, New York, William Wood & Company, 1917, vol. 2.

is already present. In the absence of such a spasm, the eyes are straight in this position, and an internal squint is present only when the patient looks in the direction of the paralytic external rectus muscle. Second, the paralytic eye is seen to move faster than its mate when adduction of the spastic internal rectus is performed. But more striking and significant is the study of the diplopic fields. The patient sees double to the greatest degree when he looks in the direction of the paralyzed external rectus; he sees double also on looking straight ahead, but likewise on looking in the opposite direction at the extreme periphery. In this last position he is entirely removed from the field of action of the paralytic external rectus, and yet he has diplopia owing to spasm of the homolateral internal rectus.

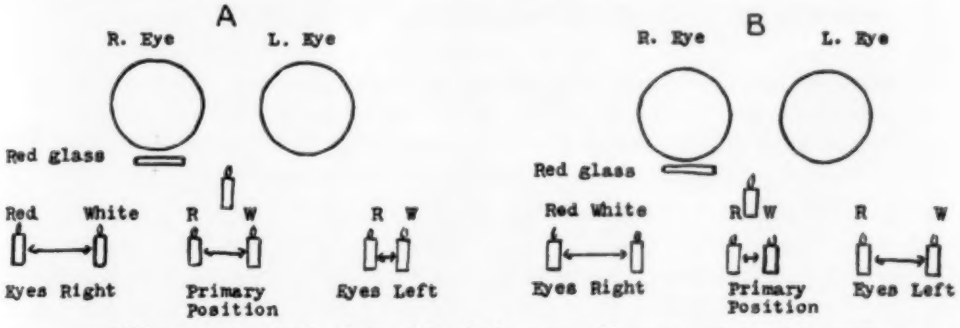
REPORT OF A CASE

The following case is illustrative of oculomotor nerve spasm.

A boy, aged 9 years, was admitted to the Coney Island Hospital on February 22 with a history of headache and pain in the right ear for three days. The right ear had opened spontaneously and was discharging freely. The temperature on admission was 102.6 F. On examination, typical mastoiditis was evident with profuse discharge, sagging of the posterior superior wall of the canal and marked tenderness and edema over the mastoid process. Examination of the left ear gave negative results. The roentgenograms showed pneumatic mastoids of the small cell type. The left mastoid was well aerated; the right showed diminished aeration, and the outline of the cells was indistinct. The next day I performed a simple mastoidectomy and found extensive destruction which included the zygoma. The temperature fell by lysis and reached the normal level in two days and remained so throughout convalescence. The patient felt well until the ninth day after operation when he complained of seeing double. A lag of the right external rectus muscle was noted which continued to increase until complete paralysis appeared several days later. Examination at this time revealed that the patient was holding the head tilted toward the right. There was a marked internal strabismus of the right eye, present even in the primary position of the eyes but increasing on working to the right. The line of vision of the right eye could not pass beyond the midline, and the diplopia increased as the patient's gaze followed the examiner's finger to the right. But diplopia was also present on looking directly ahead and even to the extreme left. The muscles of the left eye were normal. With a red glass placed before the right eye, homonomous diplopia was noted in the horizontal plane which increased to the right and was reduced but present to the extreme left. No diplopia was present in the upper or lower fields. The pupils were equal and reacted to light and in accommodation. The fundus showed no evidence of papilledema. Vision was normal. At the height of the palsy, the symptoms consisted of slight headache and vertigo in addition to diplopia. The patient at no time had severe pain in the head. Diplopia to the left was the first to clear up, and that to the extreme right, last. Strabismus cleared up simultaneously with the subsidence of the double vision.

The spinal fluid was clear and under normal pressure. One or 2 cells were present to a field. The Wassermann test was negative. Cultures from the mastoid wound showed no organisms after five days' growth.

Oculomotor nerve spasm associated with palsy of the sixth nerve brings up the question of differentiation from bilateral involvement of the sixth nerve. When both sixth nerves are completely paralyzed there is little difficulty in the diagnosis, since marked limitation of motion in the two external rectus muscles is apparent as is the presence of a convergent spasm. But when one of the abducens nerves is only partially affected, as in paresis, and the other fully paralyzed, the differentiation presents points of difficulty. It must be borne in mind that a state of paresis may exist without objective, demonstrable limitation of motion in the affected muscle, and the diagnosis in such cases often depends almost entirely on a study of diplopia. In the case just cited, no limitation of motion existed in the left external rectus muscle and yet the patient had troublesome diplopia to the extreme left. That one was



A illustrates paralysis of the right sixth nerve with spasm of the right oculomotor nerve in Gradenigo's syndrome. The red glass before the right eye produces homonomous diplopia. The distance between the two flames is greatest with the eyes directed to the right and least with the eyes directed to the left. *B* illustrates bilateral involvement of the sixth nerve in Gradenigo's syndrome, with complete paralysis of the right nerve and partial paralysis of the left. The distance in homonomous diplopia is least between the two flames in the primary position and greatest with the eyes turned to the right and to the left. What is true of diplopia applies to strabismus.

dealing with spasm of the right oculomotor nerve rather than with paresis of the left abducens nerve was indicated by the fact that diplopia was less marked on looking to the left than in the primary position of the eyes and that during recovery diplopia to the left was the first to disappear. In bilateral involvement of the sixth nerve diplopia and internal strabismus are less marked in the primary position than when the eyes look either to the right or to the left. The diagram epitomizes the essential points of difference between spasm of the oculomotor nerve and bilateral involvement of the sixth nerve.

SUMMARY

1. The oculomotor nerve, like the second, fourth and seventh nerves, is infrequently involved in Gradenigo's syndrome by pressure phenomena at the base of the skull.

2. It is, however, frequently affected in the form of a spasm of the homolateral internal rectus muscle.

3. The spasm arises as a result of a disturbance of innervation to the eye muscles following paralysis of the sixth nerve.

4. The spasm has a well defined clinical picture which should be recognized.

5. The spasm must be differentiated from bilateral involvement of the sixth nerve, which it simulates and with which it may be confused.

6. A description of the condition should be of aid in a more complete understanding of the ophthalmologic portion of the syndrome.

INTRANASAL VACCINE SPRAY

ITS USE FOR PROPHYLAXIS AGAINST THE COMMON COLD

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Vaccine therapy for the prevention of colds has been used for years with indifferent success. Reports on series of patients who have been treated by the subcutaneous injection of vaccines of various compositions have appeared in the literature since 1909. Extensive studies, for the most part adequately controlled, have been carried out in both this country and Europe, and although there have been observers who have reported excellent results, the general consensus seems to indicate that the results of the use of subcutaneous vaccination as a prophylaxis against colds have been disappointing.

Probably the most extensive controlled series so far recorded are that of von Sholly and Park,[1] reported in 1921, and that of Jordan and Sharp,[2] reported in the same year. Von Sholly and Park, working among the general employees of the Metropolitan Life Insurance Company's home office in New York, gave injections of vaccine to 1,536 persons and had as controls 3,025 uninoculated persons. They stated in their summary: "On the whole our evidence does not make a strong case in favor of the vaccine given by us as a prophylactic agent against acute respiratory diseases—pneumonia alone excepted." Jordan and Sharp had approximately 6,000 persons under observation, about one half of whom were vaccinated, the other half being unvaccinated, and the two groups lived under almost identical conditions. In their summary these authors stated: "Rhinitis and bronchitis developed with frequency about equal in the vaccinated and unvaccinated groups," and, further, "that any considerable degree of protection against influenza was conferred by the vaccine seems unlikely." On the other hand, nearly all observers have found some patients in their series who seemed to have been completely free from colds after a course of vaccination.

So far, although the composition of the vaccine has varied widely in different series of cases, the method of administration of the vaccine

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1. von Sholly, A. I., and Park, W. H.: Report on the Prophylactic Vaccination of 1,536 Persons Against Acute Respiratory Diseases, 1919-1920, J. Immunol. **6**:103, 1921.

2. Jordan, E. O., and Sharp, W. B.: Influenza Studies: Effect of Vaccination Against Influenza and Some Other Respiratory Infections, J. Infec. Dis. **28**: 357, 1921.

has been the same in each case. The subcutaneous method has always been used. Recent experimental work in local immunity by Walsh and Cannon [3] showed that local formation of a specific antibody in the nasal mucosa can be demonstrated following the intranasal instillation of vaccine. Working with rabbits, they found that following the instillation of a formaldehyde-killed vaccine of Bacterium paratyphosum B into the nostrils for more than eight days extraction of the tissues four or more days after the last instillation revealed an agglutinin titer in the nasal mucosa of between 1 : 120 and 1 : 1,920 against the homologous organism, the titer in the blood serum also being high. When, however, in other animals the titer of the blood serum had been raised by the subcutaneous injection of the appropriate antigen, the titer in the nasal mucosa was frequently below 1 : 120 and uniformly lower than that in intranasally immunized animals, despite the fact that the titer of the blood serum was approximately the same following the two methods of immunization. Histologic sections of such locally immunized tissues showed a marked accumulation of leukocytes and macrophages in the subepithelial tissues, which apparently formed a considerable barrier to the ingress of infecting micro-organisms and an effective means of limiting their spread. Furthermore, Linton,[4] working with a strain of hemolytic streptococcus which was known to be particularly virulent for rabbits, found that the animals locally immunized to this organism were definitely more resistant to living organisms introduced into the nose than were normal animals. His histologic findings are comparable to those of Walsh and Cannon.

Applying the principles emphasized by these experimental studies to the clinical problem of prophylactic vaccination against infections of the upper respiratory tract, it was decided to prepare a vaccine to be used as a nasal spray. It is the object of this article to report the results in 81 patients treated by the application of vaccine as a nasal spray.

METHODS

The vaccines used were prepared in the following manner: Cultures obtained in the Ear, Nose and Throat Clinic from various patients with acute infections of the upper respiratory tract, from patients with chronic sinusitis and from patients with otitis media and mastoiditis were planted on blood agar plates and incubated at 37 C. for from twenty-four to forty-eight hours. Typical colonies were picked from such plates for identification and for pure culture, planted in mediums suitable for quantity growth and incubated at 37 C. for from twenty-four to seventy-two hours. The organisms were then killed by adding a dilute solution of formaldehyde U. S. P. (0.4 per cent) and incubating at 37 C. for four days. This suspension

3. Walsh, T. E., and Cannon, P. R.: Immunization of the Upper Respiratory Tract, Arch. Otolaryng. **20**:820 (Dec.) 1934.

4. Linton, C. S.: Resistance of the Upper Respiratory Mucosa to Infection, Ann. Otol., Rhin. & Laryng. **42**:64 (March) 1933.

was centrifugated, and the organisms were washed once in physiologic solution of sodium chloride, a quantity of this solution being added that was equal, approximately, to ten times the volume of the packed bacterial bodies. These suspensions represented concentrated stock vaccines of the various organisms obtained. The organisms thus obtained were: hemolytic Staphylococcus albus and Staphylococcus aureus, Streptococcus haemolyticus and Streptococcus viridans, Pneumococcus, types I, II, III and IV, diphtheroid bacilli, Friedländer's bacilli and Bacillus influenzae. Several strains of each organism were obtained, and new strains were added to the stock from time to time during the year from cultures from patients with fresh cases. The concentrated vaccines were then mixed in the following proportions:

	Parts
Hemolytic Staph. albus	1
Hemolytic Staph. aureus	1
Str. haemolyticus	2
Str. viridans	2
Pneumococci (all types)	1
Diphtheroid bacilli	1
Friedländer's bacillus	2
B. influenzae	2

The mixture was diluted with physiologic solution of sodium chloride so that the turbidity of the final suspension was approximately equal to that of two billion staphylococci per cubic centimeter of suspension. Thymol, 0.1 per cent, was added as a preservative. The final suspension was tested for sterility both aerobically and anaerobically and put up in rubber-stoppered bottles for dispensing. In the first few cases studied in 1932 autogenous vaccines prepared in the manner already indicated were used, only those organisms being included which showed abundant growth in cultures of material from the nose and throat of the patient to be treated.

For the use of the vaccine the patients were advised to purchase a DeVilbiss no. 20 nasal atomizer. It is inexpensive and conveniently small, delivers a coarse spray and has the advantage of being easily cleaned and kept in working order. The patients were instructed how to sterilize the atomizer before filling it with vaccine and were advised to put only a small quantity of vaccine in the atomizer at a time and to keep the remainder well corked in the refrigerator. Six puffs of the vaccine were to be used in each nostril every night just before retiring, and it was to be well sniffed up the nose. This was to be done each night for three weeks and again after one week's rest for two weeks and continued for alternate two week periods for the remainder of the "cold year" (September to May). The patients were requested to return to the clinic one month after receiving the vaccine and after that were seen at intervals of two months. Many of the patients found it impossible to return to the clinic as often as my associates and I wished, and to obtain a final estimate of the efficacy of the vaccine a form letter containing the following questions was sent to each patient in May:

1. Have you had any colds since using the vaccine? If so, how many?
2. Are they any different from the colds you had previously?
   (*a*) More severe?
   (*b*) Less severe?
3. Have there been any complications of the colds, such as bronchitis?
4. Do you believe that the vaccine has helped you or not?

A total of 81 patients were observed.

RESULTS

The patients studied were those who presented themselves at the clinic for diseases of the nose and throat complaining of frequent colds in winter. Every effort was made to determine that the "colds" were true infections and not vasomotor reactions so often called "colds" by the laity. The patients were carefully examined to rule out chronic sinus infections, infections of the tonsils and other conditions as etiologic factors of the colds, and only those who showed no chronic nasal or faucial pathologic changes but who were subject to frequent infections of the upper respiratory tract were studied for this report. In the "cold year" of 1932-1933, 29 patients used vaccine; of these, 13 used an autogenous vaccine; 7 started with an autogenous vaccine but later continued with the stock vaccine, and 9 used only the stock vaccine. In 1933-1934 there were 68 patients, all using stock vaccine, and 16 patients used vaccine both seasons. In arriving at an estimate of the results of vaccination, the following criteria were used: (*a*) the number of colds, (*b*) the severity of the colds and (*c*) the patient's opinion of the success or failure of the treatment. It was noted that many patients complained of a mild cold lasting possibly two or three days, which occurred during, or at the end of, the first three weeks of vaccination. Patients who had as many as three of these mild colds during a winter when in previous years they had had three or more severe colds were considered to have had good results. Patients who had more than three mild colds, even if they expressed themselves pleased and considered themselves benefited by the vaccine, were rated as having only fair results. Any patient who had even one severe cold was considered to have had bad results. On this basis, of a total of 81 patients, 63 (77.8 per cent) had good results; 3 (3.7 per cent) had fair results, and 15 (18.5 per cent) had bad results. In no case was any untoward reaction observed by us or remarked by the patient.

COMMENT

There is much experimental evidence that indicates that the local application of vaccine to the nasal mucosa is the method of choice for vaccination when the nose is the portal of entry for infecting organisms. Linton [4] showed that rabbits so vaccinated were remarkably more resistant than normal rabbits to the introduction of a virulent strain of Streptococcus into the nose. Bull and McKee [5] found that rabbits after intranasal vaccination against a strain of Pneumococcus were strongly resistant to infection with living organisms by the nasal route, although they did not show any antibodies in the blood serum when the infecting dose of living organisms was given. They expressed the belief that

5. Bull, C. G., and McKee, C. M.: Resistance to Intranasal Infection in the Absence of Demonstrable Antibodies, Am. J. Hyg. **9**:490, 1929.

this "resistance of tissues to bacterial invasion . . . is probably due to an enhancement of the reaction capacity both in point of time and degree of the tissue concerned." The finding by Walsh and Cannon [3] of antibodies in the nasal mucosa following the instillation of bacterial vaccine into the nose and the fact that they can be demonstrated in the mucosa in greater concentration than in the blood serum in some instances lead to the supposition that it is possibly the local formation of specific antibodies that gives to the nasal mucosa its enhanced resistance to infection following the local application of vaccine. The results in this series seem to indicate that possibly the same effect takes place in man as in animals.

The method of immunization against colds by means of an intranasal spray has been used clinically before. In 1925, D. and R. Thomson [6] used it with beneficial results; they used a highly polyvalent vaccine mixed with bile as a spray twice a day at intervals of from two to seven days over a period of three weeks. They stated that colds or sore throat developed in none of the patients so treated. They gave no indication of the number of patients treated or of the length of time they were under observation. Warren Crowe,[7] in 1927, stated that he had treated patients with intranasal vaccination as a prophylaxis against colds for two years or more and was convinced of the efficacy of the treatment. He also did not give any indication of the number of patients so treated. Peroz [8] used an intranasal vaccine in the treatment of chronic mucopurulent rhinitis and claimed excellent results. Blumenau [9] used the intranasal application of diphtheria toxin in children in preference to the subcutaneous injection and claimed that there is only an insignificant local reaction in a few cases and no systemic reaction, but withal excellent immunity to diphtheria.

The use of a polyvalent vaccine of the type employed in this series has been criticized on many occasions. In the earlier cases seen in 1932 we used autogenous vaccines and found that when patients returned with colds the cultures from the nose and throat had predominating organisms other than those in the vaccine. This occurred so frequently that we decided that a polyvalent vaccine containing all the normal pathogens, continually freshened with new strains, would be preferable. Our later results seemed to confirm this view. Although the experi-

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6. Thomson, D., and Thomson, R.: Ann. Pickett-Thomson Research Lab., **8**:536 (Dec.) 1932.

7. Crowe, H. W.: Prophylaxis and Cure of Colds with Spray Vaccine, Brit. M. J. **2**:1164 (Dec. 17) 1927.

8. Peroz, André: Treament of Chronic Mucopurulent Rhinitis by a New Local Vaccine, Arch. internat. de laryng. **35**:1174, 1912.

9. Blumenau, N. R.: Ueber die aktive antidiphtherischen Immunisation der Kinder nach dem Prinzip von S. K. Dzerigowsky, Jahrb. f. Kinderh. **74**:141, 1911.

mental work shows that the immunity in animals obtained by intranasal vaccination is specific, and although our observations in regard to autogenous vaccines indicate that this is true in man also, we have, nevertheless, no positive proof of such specificity. It is possible that some degree of nonspecific immunity is obtained by the spraying of saline solution, thymol and other solutions into the nose. A controlled experiment is now in progress in an endeavor to verify this point.

The work of Dochez and his collaborators,[10] Foster [11] and Long and others [12] on the filtrable virus as an etiologic factor in the common cold indicates that a vaccine of such a virus is the ideal means of immunization against the common cold. No such vaccine has as yet been successfully prepared. The workers in this field suggest, however, that the virus either lowers the resistance of the tissues of the upper respiratory tract to infection or enhances the virulence of the organisms which as secondary invaders cause the symptoms of the common cold. It is suggested that the intranasal application of vaccine increases the number of specific antibodies against these secondary invaders in the nasal mucosa and so, in spite of the action of the virus, prevents their growth and spread in the tissues of the upper respiratory tract. It is possible that this is what has occurred in persons who tell of feeling the beginning of a cold, e. g., dryness in the nose and mild nasopharyngitis, which, however, clears up over night.

It seems to me that one significant advantage that the intranasal method of vaccination has over the subcutaneous method is the absence of an unpleasant reaction, either local or general. In the reports on subcutaneous vaccination against infections of the upper respiratory tract there is usually the record of a high percentage of mild local reactions following the injections and a low percentage of severe local and general reactions. In von Sholly and Park's [1] report, 62.6 per cent of all the persons vaccinated had a mild local reaction; 14.3 per cent had a moderate local reaction, and 3.3 per cent had a marked local reaction, while only 19.7 per cent escaped with no local reaction. In the same group 23.2 per cent of those vaccinated had a mild general reaction,

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10. Dochez, A. R.; Shibley, G. S., and Mills, K. C.: (*a*) Studies in the Common Cold: Experimnetal Transmission of the Common Cold to Anthropoid Apes and Human Beings by Means of a Filterable Agent, J. Exper. Med. **52**: 701, 1930; (*b*) Studies of the Etiology of the Common Cold, J. A. M. A. **95**: 1553 (Nov. 22) 1930.

11. Foster, G. B., Jr.: Etiology of the Common Cold, J. Infect. Dis. **21**:451 (Nov.) 1917.

12. Long, P. H.; Doull, J. A.; Bourn, J. M., and McComb, E.: Etiology of Acute Upper Respiratory Infection (Common Cold), J. Exper. Med. **53**:447 (April) 1931.

and 3 per cent had a marked general reaction. With the use of the spray, except for a slight tingling in the nose, no local or general reaction was remarked.

It would be unwise to draw any positive conclusions from a clinical study of this sort. In the first place, the experiment is entirely uncontrolled, as all the patients in the group were subjected to the same procedure. As has been mentioned, it is possible that the mere application to the nasal mucosa of saline solution with some thymol in it may by mild irritation enhance the reactivity of the membrane to infection and bring about nonspecific immunity. Again, the mere cleansing action of the saline solution may be a factor in the prevention of infection. That these possibilities are unlikely to be actual facts is assumed from the frequency with which patients who had used various medicated sprays and douches in the nose suffered from frequent colds. Second, the estimation of the results of any clinical procedure of this sort is made more difficult by the obvious enthusiasm of patients for any "new treatment." It must be added, however, that whenever there was doubt in our minds about the efficacy of the treatment in a particular case we labeled the results bad, despite the patient's enthusiastic protestations of benefit. This, therefore, must be regarded as a preliminary report and is offered in the hope that the intranasal method of vaccination as a prophylaxis against colds will be further tried and reported on.

SUMMARY

The reports of prophylaxis against the common cold by subcutaneous vaccination are generally disappointing. There is ample experimental evidence to suggest that immunization by means of vaccine applied locally may offer a greater hope of more efficient prophylaxis against the common cold.

The method of vaccine spray used by 81 patients resulted in good results in 78 per cent, fair results in 3 per cent and no improvement in 19 per cent.

This paper concerns an uncontrolled experiment and can be considered only as a preliminary report.

PROPHYLACTIC VACCINATION AGAINST INTRACRANIAL COMPLICATIONS FOLLOWING PNEUMOCOCCUS TYPE III MASTOIDITIS

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It is well known that the presence of Pneumococcus type III in acute mastoiditis offers a serious prognosis because of the frequency of subsequent intracranial complications. Inasmuch as these complications occur, as a rule, at least several weeks after the initial infection, attempts to induce a state of active acquired immunity should receive serious consideration. Prophylactic vaccination has been suggested by Kolmer and Amano [1] on the basis of their work with rabbits in which immunization with pneumococcus vaccines afforded protection against experimental meningitis. Barach [2] demonstrated that type-specific active immunity was acquired within six days after intradermal or intravenous injection of pneumococcus type-heterologous vaccines in cases of lobar pneumonia. Accordingly, in September 1931, a study was undertaken to determine the efficacy of immunization against intracranial infections in cases of mastoiditis due to infection with Pneumococcus type III. To accomplish this, every patient admitted to the otologic service of Mount Sinai Hospital with this disease was given a course of vaccine therapy. The vaccination was begun as soon as the bacteriologic diagnosis was made.

It is appropriate to mention at this point that the old nomenclature, "Streptococcus mucosus" or "Pneumococcus mucosus," is no longer employed in our laboratories. In our experience all the gram-positive cocci in pairs or chains recovered in cases of mastoiditis can be classified as either Streptococcus haemolyticus beta, nonmucoid or mucoid variant, or Pneumococcus type III. The identification of the latter is based on

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1. Kolmer, John A., and Amano, K. W.: The Specific Prophylaxis of Pneumococcus and Streptococcus Meningitis: I. Serum Prophylaxis, Arch. Otolaryng. **14**:125 (Aug.) 1931; The Specific Prophylaxis of Pneumococcus and Streptococcus Meningitis: II. Vaccine Prophylaxis, ibid. **15**:547 (April) 1932.

2. Barach, Alvan L.: Rate of Development of Pneumococcus Immunity, Proc. Soc. Exper. Biol. & Med. **25**:558, 1928; Induction of Active Immunity During the Course of Lobar Pneumonia, J. Exper. Med. **53**:567, 1931.

solubility in bile, and the results of agglutination and precipitation tests. If the serologic reactions with the original culture are inconclusive, the organisms are injected into the peritoneal cavity of a mouse, and on the following day cultures are made from the heart's blood. This procedure is usually sufficient to restore the type-specific agglutinability and bile solubility of the pneumococcus.

TECHNIC

The vaccination consisted of six intradermal injections administered at the rate of two a week in the following increasing doses: 0.1, 0.2, 0.3, 0.5, 0.8 and 1 cc. For doses larger than 0.2 cc., several simultaneous injections were made. The first inoculation was given within forty-eight hours after the operation and occasionally before the operation. In the latter instances, the bacteriologic diagnosis was based on cultures of the discharge from the middle ear. In order to avoid loss of time, a stock vaccine was used for the initial injection. For the remaining five injections an autogenous vaccine was employed. The autogenous vaccine was prepared by growing a pure culture of Pneumococcus type III, obtained from the mastoid pus, in 100 cc. of 1 per cent dextrose broth for twenty-four hours. The organisms were centrifugated, washed once and then resuspended in 0.85 per cent sodium chloride solution to obtain a concentration of 600,000,000 organisms per cubic centimeter. The bacteria were then killed by heating at 60 C. for one-half hour.

Twenty-seven patients with mastoiditis due to infection with Pneumococcus type III were admitted to this hospital between September 1931 and March 1934. Of these, 2 died within forty-eight hours after operation, and since they received either no vaccination or only one injection the day before death, they will not be considered in this series. Of the 25 patients receiving the vaccine therapy, 1 died five months after the mastoidectomy. This patient, a Negro, 42 years old, was admitted with a history of aural pain for five weeks, aural discharge for four weeks and hemicranial headache for two weeks. At the operation there was considerable mastoid destruction extending into the solid angle between the horizontal and superior semicircular canals, and into the deeper cells between the facial nerve and the sigmoid sinus. The patient convalesced satisfactorily. Six weeks after operation, however, he returned with a recurrent mastoiditis. This time Streptococcus haemolyticus was isolated from the pus. After a period of three months, during which time he complained of headaches, the patient developed a meningitis due to infection with Pneumococcus type III.

The remaining 24 patients made uneventful recoveries. One patient left the hospital in one week, 2 in ten days, 17 in two weeks, and 4 in three weeks. There were no postoperative complications in any of these cases. After leaving the hospital, these patients were carefully observed by the resident staff or attending surgeons for at least three months, and they remained entirely well. We believe that such patients who are free from any symptoms for a period of three months fol-

lowing mastoidectomy, and whose mastoid wounds and middle ears are healed at the end of that time, will not acquire any intracranial complications. A recent investigation (April 1934) of these patients revealed that 18 were in good health. The other 6 could not be located. Thus the mortality rate of our vaccinated patients was 4 per cent.

Of 547 patients admitted to this hospital with acute mastoiditis during the period of five years (1927 to 1931) prior to this work, 22 had mastoiditis due to infection with Pneumococcus type III. Of these, 5 died of meningitis—a mortality rate of 22 per cent. In 1 patient, meningitis became evident one week after operation; in 2 patients, two and one-half weeks after operation; in 1 patient, three weeks after operation (also complicated by an abscess of the brain); and in the fifth patient, three months after operation.

Data on the numerous experiments conducted with the object of demonstrating antibodies for Pneumococcus type III in the blood serum, presumably resulting from vaccination, are omitted from this report. For the scope of this paper it is sufficient to state that agglutinin, precipitin and complement-fixation tests have failed to show any increase in antibodies, and that mouse protection tests, which are being repeated, have been inconclusive. It is probable that an active cellular immunity may exist without demonstrable increase in humoral antibodies in the blood stream.

We are well aware that our cases constitute too small a group from which to draw definite conclusions. We also realize that Pneumococcus type III might have been a milder organism during the past three years, and that the lower incidence of cerebral complications in our vaccinated series might have been merely fortuitous. However, we feel that the facts presented warrant a report in order to stimulate further work along these lines.

Dr. I. Friesner cooperated in the study of this problem.

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DYSPHONIA PLICAE VENTRICULARIS

PHONATION WITH THE VENTRICULAR BANDS

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Dysphonia plicae ventricularis is hoarseness due to (*a*) phonation with the ventricular bands or (*b*) difficulty in phonation due to the vicarious assumption of the duty of the true vocal cords by the false cords, anatomically known as the ventricular bands.

The frequency of hoarseness due to phonation by the ventricular bands is difficult to determine by general statistics because the condition is evidently not generally recognized by laryngologists. Our own records of cases have not been regularly cross-indexed for this condition, but a fair estimate is that in about 4 per cent of the cases of hoarseness encountered the dysphonia is due to this vicarious assumption of phonatory duty by the ventricular bands.

As keen an observer as the father of laryngology, Sir Morrell McKenzie, does not seem to have recognized the possibility of phonation by the ventricular bands. In insisting on the use of the latter name for these structures he stated: "The retention of the term false vocal cords perpetuates the memory of a physiological error." Either he had never seen a case or he had not recognized the condition.

ETIOLOGY

Underactivity of the True Vocal Cords.—A sluggish approximation of the vocal cords in some cases has seemed to allow time for the ventricular bands to approximate first; as soon as they do, the true cords are covered and prevented from vibrating. The cause of the sluggish action may be impairment of the muscular activity, fatigue of the muscles, impaired innervation or arthritis of the crico-arytenoid joints. The determination of this point has been made by passive motion of the arytenoids with the direct laryngoscope, using closed forceps to impart passive motion. In many cases the disease in the arytenoid was obvious, as in tuberculosis, syphilis, contact ulcer and cancer.

Overactivity of the Ventricular Bands.—In some cases it has seemed that the ventricular bands were, so to speak, extremely alert and so abnormally quick to respond to the phonatory impulse that the true cords did not have the normal amount of time to approximate before

they were anteceded by the ventricular bands. In some cases this hyperactivity has seemed to be associated with muscular hypertrophy. In many instances the hyperactivity has started when the voice was strongly forced during the temporary impairment of the vocal cords in acute laryngitis (case 4).

Absence of the True Vocal Cords.—In many of our cases one or both true cords had been destroyed by disease. In these cases the ventricular bands seemed to be performing their true function in taking on the duties of the lost cords. This vicarious functioning is seen also after ventriculocordectomy [1] and is, in these cases, the result most desired. It obviates waste of air and produces a good voice. When a cord has been removed for very early cancer without removal of any part of the ventricular band it is possible for the ventricular bands to assume the function of phonation. We have seen only two such cases, however; this small number of cases is probably due to the fact that at least a part of the ventricular band is usually removed and that a cicatricial adventitious cord is usually pulled out by the continuous drag of the arytenoid cartilage.

Congenital Anomaly.—This condition as a cause is suggested by the following case:

CASE 1.—*Phonation with the ventricular bands mistaken for prolapse of the ventricles.*

A woman, aged 22, was referred with a diagnosis of prolapse of the ventricle. In childhood her voice and her crying had not seemed like those of other children; at times during adolescence she had been aphonic and was supposed to have had hysterical aphonia. Examination with a mirror showed phonation with the ventricular bands. The cords were invisible with the mirror but, though quite rudimentary, could be demonstrated by direct laryngoscopy. This patient did not improve, objectively or vocally, under treatment lasting many months.

Comment.—There seemed to be justification for regarding this case as congenital. The cords seemed mere rudiments though this condition may have resulted from lack of use. It did not seem justifiable to nip out a piece of rudimentary cord for examination.

Tumors Mechanically Propping the Cords Apart.—These may cause the ventricular bands to take on vicariously the function of phonation, as in the following case:

CASE 2.—*Phonation with the ventricular bands due to fibroma between the cords.*

A boy, aged 17 years, was referred for the removal of a rather broad-based tumor attached to the anterior portion of both vocal cords, causing dyspnea and wheezing. It was said that the patient's voice had had a peculiar quality all his

1. Jackson, Chevalier: Ventriculocordectomy: A New Operation for the Cure of Goitrous Paralytic Laryngeal Stenosis, Arch. Surg. **4**:257 (March) 1922.

life. When he came to us it was rough and low pitched. On examination with a mirror it was seen that during ordinary breathing a tumor, apparently hard and resembling a fibroma, propped the cords widely apart, leaving only a small, rectangular glottic chink posteriorly. On phonation this chink diminished slightly, but almost immediately the chink, tumor and cords were shut off from view by the approximation of the ventricular bands. The edges of the bands vibrated and produced a rough though loud tone. Histologically the tumor was a fibroma. After its removal the cords gradually resumed their normal function, and the hypertrophic ventricular bands gradually ceased their vicarious function without treatment. When the larynx was last examined about six months after the removal of the tumor the bands approached within about 3 mm. of each other, but did not vibrate. The true cords gave a good though not perfectly clear tone.

ANATOMIC AND PHYSIOLOGIC CONSIDERATIONS

The ventricular bands are, normally, folds of elastic connective tissue containing fat cells and a few muscular fibers derived from the thyro-arytenoideus of the corresponding side. They are covered with mucous membrane continuous with that of the aryepiglottic folds externally, that of the base of the epiglottis anteriorly and that of the anterior face of the arytenoid eminence posteriorly. They are attached quite firmly to these structures. The under surface of the bands forms the roof of the ventricles. The free border of the band is thin and has been called a ligament; compared to the rest of the band its thinness, though of much less degree, is similar to the thinning of the vocal cord at its free border relative to its supporting structure. In some persons the ventricular bands seem overdeveloped, and their inner borders are much nearer each other than in the average subject. It is a question whether or not in these persons the bands at some previous time vicariously assumed duty during a temporary disability of the vocal cords. In a few instances this seemed probable from the previous medical history. In cases in which no such probable cause exists we may assume that the bands were congenitally well developed and possessed an unusual amount of muscular tissue. Be this as it may, there was in many cases no reason to doubt that overactivity was responsible for the development of an abnormally prompt and active approximating mechanism.

The function of the ventricular bands is to assist in the closure of the airway. It is true that closure of the airway is, among other things, necessary for setting in vibration the expiratory air current to produce phonation, yet normally the airway is closed by the vocal cords with no assistance from the ventricular bands. The closure of the airway by the bands is quite powerful, much too powerful to be exerted solely by the action of the scattered fibers of the thyro-arytenoidei usually found within the connective tissue of the bands. In some cases these are hypertrophic, but it is certain that the functional occlusion is due to the combined action of all the closing muscles of the larynx,

including the thyro-arytenoidei, the arytenoideus and the crico-arytenoidei laterales. The crico-arytenoidei posteriores coordinate by relaxation rather than by contraction. Though the ventricular bands are not considered as in any way participating in normal phonation, close study of the movements of the larynx of professional vocalists gives the impression that in trained singers they have much to do with voice production. During some of the highly cultivated, artificial, artistic vocal gymnastics such as the trill and the tremolo these movements are remarkable. In vocalists the upper part of the thyro-arytenoideus is probably hypertrophied by training.

In some of the cases of cancer which showed phonation with the ventricular bands we had an opportunity to examine the larynx after its removal at laryngectomy, and we found that the upper part of the thyro-arytenoideus was hypertrophied. We have had no opportunity to perform an autopsy on a patient in whom the condition of phonation with the ventricular bands was known to have been present during life.

Functions Other Than Phonatory.—Beside phonation the vocal cords have other duties—protective, tussive and expectorative. It is interesting and important to know to what extent and with what degree of efficiency these functions are carried on vicariously by the ventricular bands in cases of destruction or serious impairment of the true cords. This has been considered elsewhere.[1]

SYMPTOMATOLOGY

In a well established case of phonation with the ventricular bands the voice is rather deep in pitch and more or less rough in quality. In a case of very long standing in a patient who has taken especial pains to train the voice the phonation may be smooth and not far from normal in pitch.

Diplophonia (Diphthongia).—Double voice is nearly always present in the early stages of the dysfunction. The patient complains that his voice "breaks"; by this he means that he can never be sure of the pitch; when he starts speaking, at times it may seem very good; at other times he may produce a deep or loud tone or may be unable to produce any sound above a whisper. Sometimes he may start speaking in a high-pitched tone, then the voice may break to a low pitch, and vice versa. Sometimes two tones are produced at once. In some of these cases the true cords and the ventricular bands both produce sound, usually alternating. Of course diplophonia may occur as the result of imperfect control, especially of imperfect action of the tensors; sometimes other muscles are at fault.

The patient may complain of a feeling of local fatigue after using his voice for a long time (case 4). In some patients this comes on

every evening and may be accompanied by aching and, rarely, by pain extending to the ears.

Image as Seen in a Mirror.—In a typical, well developed case the action during phonation is so much like that of the vocal cords that many experienced laryngologists have not noticed that the cords are not seen and that it is the borders of the bands that are in vibration. There is such a roughness to the voice that the observer does not expect to see normal cords and accepts the image as that of intensely inflamed and thickened cords. The vocal cords are hidden below the bands; they approximate sometimes perfectly, more often imperfectly, but always late. The delay allows the overactive ventricular bands to approximate and to hide and dampen them. This was beautifully demonstrated in the following case:

CASE 3.—*Phonation with the ventricular bands following diphtheria and high tracheotomy.*

A girl, aged 12 years, had had a tracheotomy for diphtheria. Six months later she was referred to us because of inability to remove the cannula. The difficulties in decannulation were due, as they so often are, to too high a tracheotomy [2] and to the wearing of too large a cannula, but these errors enabled us to get a good retrograde view of the larynx with a very small throat mirror (4 mm.). Introduced into the tracheotomic fistula and faced upward in the trachea it showed the inflammatory bands approximating first, then the normal cords coming together in an apparently normal way. Observed with the mirror from above the cords could not be seen at all and did not seem to make any part of the sound when, with the fistula closed, the patient attempted to say "E-e-e." The cannula was removed by our method of graded corking [3] after substitution of a smaller cannula. At first the child was wary, but after we obtained her confidence she was cooperative and faithful in vocal restraint. In the course of about six months of systematic effort as outlined in case 4 phonation was done with the cords in the normal way. On phonation the ventricular bands approached somewhat but not closely enough to phonate or to interfere with the vibration of the true cords.

COMMENT

Inflammatory bands and normal cords are often seen in cases of dysphonia plicae ventricularis.

In many cases the cords may be seen to touch, but before they can vibrate they are covered and damped by the closely following approximation of the ventricular bands. In some cases the cords are seen to commence to vibrate and emit a short sound before they are damped. This often results in a double tone that has been called diphthongia or

2. Jackson, Chevalier, and Jackson, Chevalier L.: Bronchoscopy, Esophagoscopy and Gastroscopy, Philadelphia, W. B. Saunders Company, 1934, p. 110. Jackson, Chevalier: High Tracheotomy and Other Errors the Chief Causes of Chronic Laryngeal Stenosis, Surg., Gynec. & Obst. **32**:392 (May) 1921.

3. Jackson, Chevalier: Peroral Endoscopy and Laryngeal Surgery, St. Louis, Laryngoscope Co., 1915, p. 641.

diplophonia apparently without knowledge of the mechanism of production.

The chief reason for overlooking the fact that it is the ventricular bands that are phonating is the invisibility of the ventricle of the larynx. It is not always realized, in routine mirror examinations, that there is a deep cavity separating the true cords from the ventricular bands.

DIAGNOSIS

Phonation with the ventricular bands is usually recognizable in the mirror, but the false flattening of the image seen in the laryngeal mirror is misleading as to levels. In some cases direct laryngoscopy is the only certain method of diagnosis. Another need for the use of direct laryngoscopy is to see the true cords in cases in which these are completely hidden by the ever ready approach of the overactive ventricular bands.

Some of the difficulties and pitfalls in diagnosis are illustrated in the following cases:

CASE 4.—*Phonation with the ventricular bands mistaken for cancer.*

A carpenter, aged 52, had had hoarseness with pain in the throat and ears for about two years. Following an examination with a mirror he was told that he had cancer of the larynx requiring laryngectomy. Before consenting to the operation he went to another laryngologist who questioned the diagnosis of malignant disease, though he was uncertain as to the nature of the lesion. He thought that a biopsy should be done and sent the patient to us. On examination with a mirror the vocal cords were invisible; the ventricular bands were hypertrophic, intensely inflamed and granular. Superficial ulceration was visible on the inner margin of the right ventricular band (fig. 1 *A*). On phonation (fig. 1 *B*) the bands came together and a hoarse sound was emitted. On direct laryngoscopic examination it was plain that the appearance of ulceration in the mirror was only a superficial erosion on an intensely inflamed granular mucosa. Questioning the patient brought out the fact that though he was a carpenter he had for the past two years been foreman in a planing mill. It was necessary for him to shout all day long in directing his men so as to be heard above the buzz and roar of the planing machines. Each evening his throat ached. Shortly after he commenced this work an attack of influenza had made him very hoarse, and he had been so ever since. He was put on a silent regimen and told to write every word he had to say. On reexamination with the mirror at the end of one month the erosions and the granular inflammation of the mucosa had disappeared. On attempts to emit the sound "E-e-e" the cords were momentarily seen, then they were hidden by the approximation and attempted phonation of the ventricular bands. When the patient said "Oh" in a very quiet relaxed voice, low in both sound and pitch, the cords were seen to phonate. He was instructed to practice this one word in this very low quiet way. Later other words were selected. In six months normal phonation with normal cords was perfectly restored. He had one recurrence when he attempted to return to his former occupation and to shouting in the planing mill. He returned to his trade as a carpenter and acquired the habit of always speaking in a low tone. On breathing and on phonation his larynx was perfectly normal when seen two years later.

Comment.—The forced use of the voice during acute laryngitis and the subsequent violent forcing of the voice are both common causes of phonation with the ventricular bands. The diagnosis of malignant disease was not altogether unwarranted by the appearances in the mirror, but to have performed a laryngectomy without a biopsy would have been a tragedy. The relief of the patient's fear and dread when the condition was proved benign can be imagined. The diagnosis by direct laryngoscopy is the most certain method, and it determines the condition of

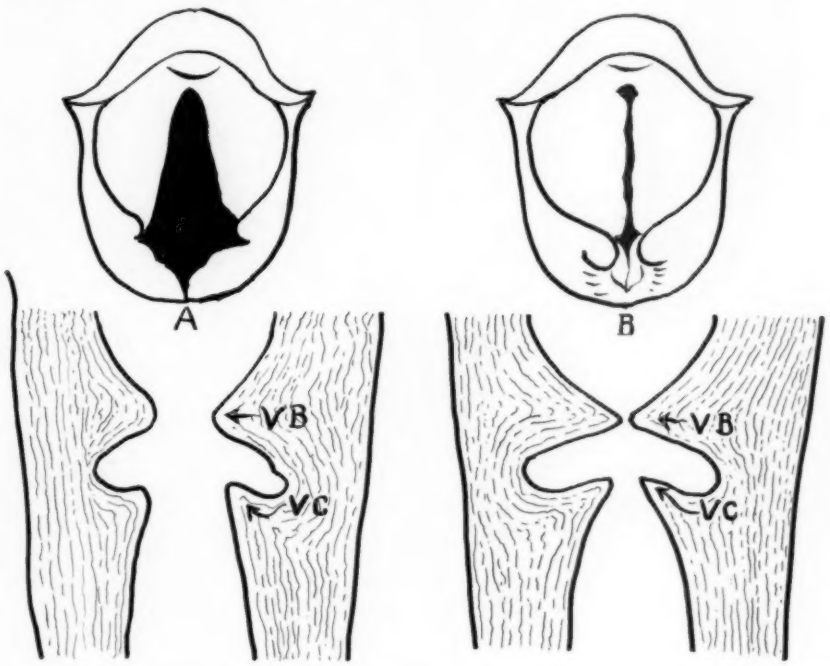

Fig. 1 (case 4).—Schematic illustration of the mechanism of phonation with the ventricular bands from a combination of hypertrophic, aggressive activity of the bands with sluggish activity of the vocal cords. On inspiration (*A*) the cords are invisible under the hypertrophic ventricular bands. On phonation the cords approximate but not quickly enough to reach the midline before the aggressively active ventricular bands have reached contact in the midline and have begun to vibrate. Sometimes in this patient the cords touched each other first and started to vibrate; the ventricular bands then usurped the function and the cords were "dampered." A double voice (dipthongia) occasionally resulted. This case was diagnosed as "congenital absence of the vocal cords" by one laryngologist and as "enormously thickened vocal cords due to chronic laryngitis" by another. A third laryngologist expressed himself as unable to analyze the image seen.

the true cords. The treatment used in this case is nearly always successful if the cords are normal or nearly so.

Phonation with the ventricular bands may occur either with or without destruction of the tissue of the cord. The following is an example of the latter condition:

CASE 5.—*Hoarseness due to phonation with the ventricular bands in a patient with early tuberculosis.*

A woman, aged 18, suddenly became voiceless while teaching. She stated that her voice broke to a whisper; she then said a few words in a slightly louder but hoarse tone, and then the voice broke again. She gave up teaching. Her family physician made a diagnosis of hysterical aphonia and sent her to a laryngologist

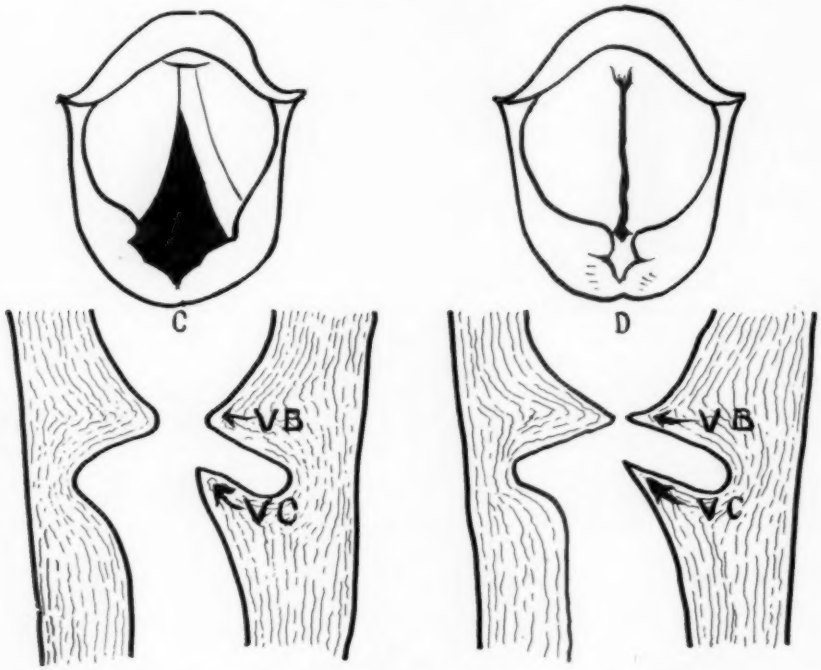

Fig. 2.—Phonation with the ventricular bands after laryngofissure for cancer of the larynx. No adventitious cord had formed to cooperate with the healthy cord (*V C*) in phonation. The ventricular bands (*V B*) assumed the duty vicariously and phonated well.

who concurred in the opinion. For six months she was treated by a neurologist; the result being a gradual return of a certain degree of phonation, but the voice was rough and unreliable. Examination with the mirror showed normal vocal cords, swollen reddish ventricular bands, arytenoid eminences and a normal epiglottis. When the patient said "E-e-e" the ventricular bands approximated, hiding the vocal cords. The sound emitted was hoarse, irregular and deep. When the ventricular bands were in opposition the edges were seen to be eroded with a few small patches of grayish secretion. General examination by the family physician and by an internist revealed no clinical signs of tuberculosis in the lungs or elsewhere. The erosion and swelling of the ventricular bands were, however, so suggestive of tuberculosis that the patient was sent to a roentgenologist who made a

roentgen diagnosis of pulmonary tuberculosis involving both apexes. The progress under a strict antituberculous regimen was not very favorable. The patient was then sent to Arizona with orders to observe absolute silence for two months, after which she was to be allowed twenty-five words a day if conditions warranted. At the end of three months she returned because of extremely depressing nostalgia. The larynx appeared perfectly normal; the cords approximated, drew tense and phonated clearly. Slight improvement had taken place in the roentgen appearances of the apexes. After the patient had spent a few weeks at home she returned to Arizona. In six months she was apparently well and had remained so when seen two years later.

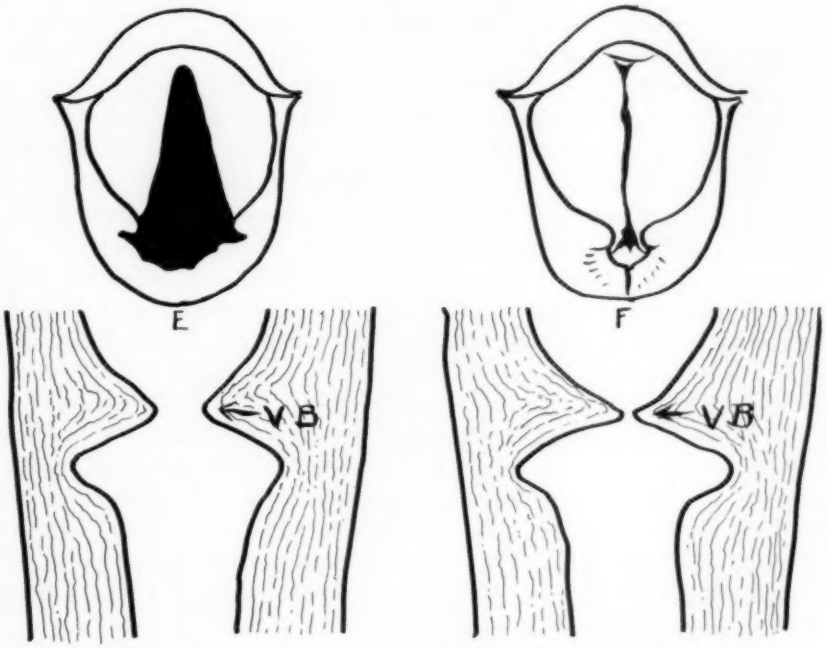

Fig. 3.—Phonation by the ventricular bands after bilateral ventriculocordectomy in a case of bilateral recurrent paralysis. On inspiration (*E*) the bands (*V B*) separated widely; on phonation they approximated and phonated well. The voice was rather deep in pitch and somewhat rough.

Comment.—Though hoarseness and swelling of the ventricular band are not uncommon in laryngeal tuberculosis, this case is interesting as showing how the relatively rare phonation with the ventricular bands may be overlooked by experienced laryngologists. The vocal cords were so tardy in adduction as to be invisible on phonation and so prompt and efficient on abduction as to be invisible on inspiration after phonation. As the patient was tuberculous care as to future sparing of the voice was enjoined.

PROPHYLAXIS

If the condition is recognized early a full development can be prevented by a logopedic instructor (an expert in defects of speech, not a teacher of vocal music).

TREATMENT

In cases of loss of the true cords the treatment, of course, takes the form of encouragement and the fullest possible development of the phonation with the ventricular bands. Phonation is watched with the mirror, and when the best tone is emitted the patient is instructed to practice producing that particular tone; the instructor then takes him in charge and helps in the development of the tone. Other tones are found and developed until good control and full range are obtained.

In patients with good cords the first step is to determine the type and the cause of the dysfunction. The next step is to determine exactly the particular phase of effort of phonation at which the ventricular bands are forced into action. On the accuracy with which these determinations are made will depend the success of the treatment. The ventricular bands require more forceful vocal effort to bring them to approximation; therefore the patient is encouraged to talk in a low tone, in a quiet place and with the least possible effort. When we say "low tone" in this connection we mean low as to sound not as to pitch. It is often better to say nothing about pitch so that the patient will make the least possible effort. When the observer detects by his ears or by means of a mirror that a tone has been made with the true cords the patient is instructed to repeat that tone frequently until he acquires ability to use his true cords for that tone. The same thing is repeated with other tones until full control and full range are obtained.

A preliminary regimen of silence is advisable, especially for patients showing chronic inflammatory changes of the mucosa of the ventricular bands. If that pernicious form of treatment, endolaryngeal applications of silver nitrate solution, has been used its immediate cessation is imperative. All irritative forms of treatment are contraindicated.

In patients with good cords aggressive overactivity of the ventricular bands can be checked by nipping out a very small bit of tissue from the center of the free edge of each ventricular band. Before this is done, however, it is necessary to be certain that the vocal cords will be able to approximate, draw tense and vibrate.

Recurrence.—Any violent vocal effort causes recurrence. The patient must be warned against any such abuse of the voice. The recurrence is treated in the same way as the original trouble; usually results are more quickly obtainable because the patient already understands the method.

SUMMARY

1. Phonation with the ventricular bands is a rather frequent and usually unrecognized cause of hoarseness.

2. It may be a vicarious dysfunction with a pathologic basis or a physiologic compensation for lost or impaired vocal cords.

3. When it is a desirable compensatory function a good voice can be developed by systematic training.

4. When it is a usurpation of function by aggressively overactive ventricular bands, or when the resumption of activity by temporarily disabled vocal cords renders persistent phonation with the ventricular bands undesirable, this phonation can be checked by training, or if necessary by operation.

5. The operation consists in nipping out a bit of tissue from the middle of the free edge of one or both ventricular bands. Before this is done, however, it is necessary to be certain that the vocal cords can approximate, draw tense and vibrate.

ADENOMA OF THE ESOPHAGUS

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AND
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Benign tumors of the esophagus are of special interest because of their comparative rarity and because the majority of such tumors are amenable to treatment. It is therefore essential that they be recognized and distinguished from the malignant tumors, which are comparatively numerous and resistant to all forms of therapy. Unfortunately, however, the benign tumors lack distinctive clinical and roentgenologic features, and the presence of such a growth must be considered in all cases of dysphagia of unknown origin. They can be accurately distinguished only by esophagoscopy and biopsy.

The rarity of benign tumors of the esophagus is well illustrated by the studies of Patterson.[1] In a review of the literature from 1717 to 1932, she was able to find a record of only sixty-one cases, including those in which the tumor was first recognized at the time of postmortem examination. To this series she added a case of a patient who had been under her observation, thus bringing the total number to sixty-two. Since then other cases have been reported in the literature, and increased interest has been aroused in these neoplasms.

The types of benign neoplasm which may involve the esophagus are: adenoma, fibroma, hemangioma, leiomyoma, lipoma, lipomyoma, myoma, myxofibroma and papilloma. Among the rarest of these is adenoma. The esophagus also may be involved by aberrant thyroid tissue, cysts and polyps.

The first case of adenoma of the esophagus was reported by Weigert[2] in 1876; the condition was discovered accidentally at the time of a postmortem examination. In this case the patient had not had symptoms referable to the esophagus. Recently, Hicquet and Jourdain[3] reported the case of a patient under their observation in which the tumor was recognized and diagnosed clinically and in which the clinical diagnosis was confirmed by microscopic examination. We have recently

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From the Division of Medicine and the Section on Surgical Pathology, the Mayo Clinic.

1. Patterson, Ellen J.: Benign Neoplasms of the Esophagus, Pennsylvania M. J. **36**:244 (Jan.) 1933.

2. Weigert, Carl: Ein Fall von Adenoma polyposum Oesophagi, Virchows Arch. f. path. Anat. **67**:516, 1876.

3. Hicquet, G., and Jourdain, V.: Un cas d'adénome de l'oesophage, Scalpel **86**:231 (Feb. 18) 1933.

observed a patient who had such a tumor and noted that the roentgenoscopic and microscopic observations were in close harmony with those reported by Hicquet and Jourdain. Because of the rarity of the tumor it seems worthy of a more or less detailed report.

REPORT OF A CASE

A man aged 48 was admitted to the Mayo Clinic on June 21, 1933, complaining of dysphagia. He had had excellent health until two years previously, when he had begun to suffer from a sense of burning in the epigastrium which appeared from twenty to thirty minutes after meals. This had been relieved by the ingestion of sodium bicarbonate and food. A year previous to examination, while

Fig. 1.—Roentgenogram showing stricture of the lower part of the esophagus.

eating rapidly, he first noticed dysphagia. Since then there had been difficulty in swallowing solid food, such as meat and dry bread. Liquids caused no discomfort unless they were taken immediately after solid food. At the onset, the obstruction seemed to be situated under the upper end of the sternum; later it seemed to be situated at a lower level. When obstruction occurred, there was an associated pain in the upper part of the epigastrium; this occasionally extended through to the back. The clinical history otherwise was essentially irrelevant.

Physical examination did not disclose anything of importance other than a right inguinal hernia. The roentgen examination revealed a stricture of the lower part of the esophagus (fig. 1). The Wassermann test of the blood, urinalysis, blood count, roentgen examination of the chest and other laboratory examinations did not disclose anything of importance. Esophagoscopy was performed with the patient under local anesthesia, and an obstructing flat, tumorous mass was discovered

in the lower part of the esophagus. There was no ulceration or bleeding. Tissue was removed and examined microscopically. It disclosed only an inflammatory condition of the mucous membrane. Because of the obstruction the esophagus was dilated to the diameter of a no. 45 French sound; Plummer sounds were used. This gave the patient considerable relief and enabled him to eat without difficulty. On account of the uncertainty as to the nature of the lesion and because of the previous microscopic observations, a second esophagoscopy was performed, at which time tissue was removed for microscopic diagnosis. Microscopic examination disclosed an adenoma, which was well differentiated (fig. 2).

Fig. 2.—Photomicrograph of a section from the adenoma of the esophagus; magnification, × 160.

The esophageal tumor did not seem to account adequately for the epigastric distress. Further roentgen examinations of the stomach and duodenum were made which revealed a duodenal ulcer with a central crater.

The clinical picture was therefore that of a benign tumor of the esophagus, a duodenal ulcer and a right inguinal hernia. Following the dilation of the esophagus, the patient was able to eat without difficulty, and in view of the benign nature of the tumor it was thought best to follow a conservative course and to observe further developments. The duodenal ulcer was of such short duration and was so free from complicating factors that medical management was regarded as the procedure of choice. The hernia, however, was of such a size that it produced

discomfort; therefore operation was advised and was requested by the patient. This was done, and the patient made a prompt recovery.

The patient returned to the clinic on May 21, 1934. He had been well until six weeks previously, when he noted a slight recurrence of the dysphagia. This was followed three weeks later by emesis of about 100 cc. of blood, with an increase in the degree of the dysphagia. In the estimation of the patient there had been no recurrence, however, of the symptoms of the duodenal ulcer.

A roentgen examination of the esophagus and duodenum disclosed practically no change from the observations disclosed on the previous examination. Esophagoscopy likewise revealed little change in the size and nature of the lesion of the esophagus. Tissue which was removed from the tumor revealed it to be an adenoma. The exact origin of the bleeding was not ascertained. As there were no gastric symptoms and the bleeding had ceased, gastric exploration did not seem advisable. The advisability of performing resection for the adenoma was considered and was deemed justifiable if dysphagia progressed. The patient did not wish to undergo an operation at this time but planned to do so if further difficulty developed.

CONGENITAL WEB OF THE LARYNX

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PHILADELPHIA

Congenital web of the larynx is extremely rare. Hodge,[1] of Montreal, in an article published in 1930, quoted St. Clair Thomson's [2] statement that only twenty-three authentic cases of congenital laryngeal web have been reported. Since the appearance of Hodge's article, Clerf [3] has contributed a valuable article on congenital web of the larynx, and Wilkinson,[4] under the title "Congenital Stenosis," has reported another case of congenital web in which the condition responded to direct laryngoscopic bougienage and incision. Kriegsmann [5] under the title "Surgical Treatment of Congenital Laryngeal Diaphragm" recorded a case in a woman, 26 years of age, in which the operative method of cure was a failure. In Hodge's case of a child 5 years of age, cure was brought about by Jackson's technic of incision of the web followed by dilation through the laryngoscope.

The case that I wish to report presents several interesting features.

REPORT OF A CASE

A girl, 20 years of age, was referred to me by Dr. Myron Zacks of Philadelphia. She had been sent to him for examination from the clinic for disorders of speech at Pennsylvania State College by Mr. Herbert Koepp-Baker, director of the clinic. The patient, according to the mother's statement, had never been able to produce a clear vocal sound since birth and from the time she was old enough to talk had had a whispered voice. Otherwise she had been a well developed, healthy child. She had scarlet fever and diphtheria when 11 years of age, without any serious complication as to breathing and with no change in her voice. A number of physicians had been consulted, but none had suggested the possibility of stenosis due to web of the larynx previous to Dr. Zacks' examination. The girl had developed normally, had graduated from high school at the age of 19 and had been referred to the clinic for disorders of speech at Pennsylvania State College for examination and vocal training.

Read before the Section of Otolaryngology of the College of Physicians of Philadelphia, April 18, 1934.

1. Hodge, G. E.: Canad. M. A. J. **22**:535 (April) 1930.

2. Thomson, St. Clair: Diseases of the Nose and Throat, London, Cassell & Company, Ltd., 1928, p. 501.

3. Clerf, L. H.: Tr. Am. Laryng. A. **53**:215, 1931.

4. Wilkinson, R. W.: Congenital Stenosis of the Larynx, J. A. M. A. **102**: 1756 (May 26) 1934.

5. Kriegsmann, G.: Ztschr. f. Hals-, Nasen- u. Ohrenh. **33**:218, 1933.

After efforts at vocal development at the clinic had failed, the patient was referred to Dr. Zacks, who, on examination of the larynx, found a congenital web and referred the patient for direct examination and treatment. In the available literature on congenital web or diaphragm of the larynx there has been described a membranous structure uniting the margins of the cords, in many instances interfering little with breathing and to a greater or less degree with phonation, depending on the extent to which the cords were involved. Examination of the congenital anomaly in this case showed a condition different from that previously described in the literature. The web involved the middle thirds of the cords, appearing as a thin, semitransparent grayish membrane, almost triangular in shape. The anterior thirds of the cords appeared to be adherent from the anterior border of the weblike formation to the anterior commissure. The margins of the cords could be distinguished parallel in the thick portion of the diaphragm-like structure. On either side throughout the anterior thirds of the cords the tissues seemed to be thinned out so as to be almost transparent (fig. 1 *A*). The appearance

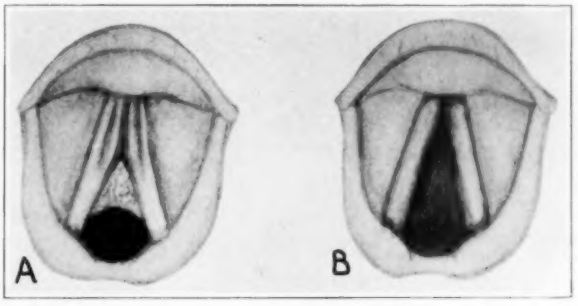

Fig. 1.—*A*, sketch of the mirror appearance of the larynx, showing a thin transparent web formation in the middle thirds of the cords, with fusion of the cords anteriorly. The patient had a whispered voice from birth to the time of examination, when she was 20 years of age. *B*, appearance of the larynx after incision of the web and the fused portions of the cords, followed by gentle dilation. At this time the patient had a clear voice.

at once suggested the danger of attempting excision of the web, because in so doing the margins of the cords and the anterior thirds would be removed. Therefore, the method of treatment decided on was incision of the thin portion of the web posteriorly and extension of the incision forward between the adherent margins of the cords in the anterior thirds.

When the posterior half of the thin, weblike portion was incised, the true structure of the anterior portion could be seen, and it was found that the anterior half of the diaphragm-like obstruction consisted of a marked subglottic thickening that extended down the anterior wall of the larynx. In order to separate the margins of the cords that were adherent, the incision was carried forward and deeply enough to cut the subglottic extension. The thin portion of the web quickly disappeared after incision and gentle dilation. The thick fleshy portion, however, required repeated incision, and all attempts at dilation produced so much trauma that the use of a dilator was abandoned. At biweekly intervals, however, the incision between the cords was repeated, and local application of compound tincture of benzoin was made at each treatment. This solution seemed to give admirable results,

as it prevented immediate adhesion of the cut surfaces by the filmlike deposit that it left on the raw surface of the cords and allowed epithelization to occur without adhesion of the denuded margins of the cords. The treatments were repeated until the cords were completely separated and apparently fully covered with epithelium into the anterior commissure. Vocal exercises were practiced by the patient under the direction of Mr. Koepp-Baker of the clinic for disorders of speech of Pennsylvania State College, and the patient cultivated a good speaking voice. Mirror examination two days before the time of writing, however, showed that there was still slight thickening in the anterior commissure, with fusion of the ends of the cords (fig. 1 *B*). It is believed that the tone produced by the vibrating cords can

Fig. 2.—Laryngeal knife devised for the treatment of this patient, used through the direct laryngoscope for incision and gentle dilation of the fused cords (from Tucker, G.: Tr. Am. Laryng. A., 1934).

be further improved by repeated incision, local application and separation of the denuded margins of the cords by a laryngeal knife made especially for this purpose (fig. 2).

COMMENT

The web, judging from the patient's history, was congenital. Although the patient had only a whispered voice, she had graduated from high school with honor, her lack of voice apparently not being a serious handicap.

It is remarkable that the condition had been overlooked on repeated examination during the period of twenty years.

The character of the web was unusual, the posterior half being thin and transparent and the anterior portion showing fusion of the margins of the cords, with a very thick subglottic extension (fig. 1*A*).

The condition responded well to the method of treatment used, namely, incision, the local application of compound tincture of benzoin to the freshly cut edges and gentle separation of the margins of the cords to prevent adhesions.

Because of these points of interest, it was thought worth while to report the case.

DIAGNOSIS AND SURGICAL TREATMENT OF TUBERCULOSIS OF THE LARYNX

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Much has been written about the etiology and pathology of tuberculosis of the larynx. I shall not repeat this, but shall review some of my practical experience with about six hundred cases of tuberculosis of the larynx during the past ten years. The large amount of material with which I have had the opportunity to work enabled me to use a number of new methods for the first time in this country.

Tuberculosis of the larynx is sadly neglected both by the general practitioner and by the laryngologist. It is often looked on as a fatal complication arising during active pulmonary tuberculosis. It is my opinion, however, not only that in a large number of cases laryngeal tuberculosis can be cured but that there are many cases in which the active treatment contributes largely to the improvement and ultimate cure of the underlying pulmonary condition. Such cases, of course, must be carefully selected, and adequate treatment must be given. There seems to be a widespread opinion that the treatment should be restricted to the disease in the lungs and that by improving the diseased lungs improvement of the larynx will automatically ensue. This is certainly true in some cases and is, for instance, demonstrated by the favorable change in the laryngeal condition following repeated pneumothorax, as described by Dworetzky [1] and others. But this by no means applies in all cases.

From a practical standpoint there are two kinds of laryngeal tuberculosis: first, that which immediately responds to local treatment, and, second, that in which any kind of local surgical intervention is strictly contraindicated for a certain time. It is therefore of greatest importance that the laryngologist rule out such cases as will not respond immediately to local treatment. It is well known that patients with apparently small lesions in the larynx sometimes become definitely worse if they are subjected to indiscriminate active local treatment.

It would lead too far to explain in detail everything that should be considered in selecting the different cases suitable for the local treatment of the larynx. However, I wish to emphasize that only patients with good general resistance to both the pulmonary and the laryngeal infection respond favorably to laryngeal treatment. Therefore, each patient

1. Dworetzky, J. P.: Laryngeal Tuberculosis: A Three Year Study, Tuberculosis Monograph no. 2, New York City, Department of Health, 1916, p. 43.

should be studied carefully, both clinically and with the help of laboratory examinations, before any treatment is instituted, especially before he is subjected to a laryngeal operation.

Preliminary general treatment is necessary in some cases in order to create and build up the recuperative power of a patient, and in such cases radiation therapy plays an active part. In febrile, toxic cases in which there is an active pulmonary lesion, long treatment of the diseased lungs is often required before laryngeal surgical intervention can be tried. Later in this paper I shall point out a laryngeal test which I have found valuable in ascertaining whether the patient has the necessary healing power.

DIAGNOSIS

First, however, it is important to establish the diagnosis of existing laryngeal tuberculosis. As in most other ailments, it is of great advantage to discover the disease in its incipient stage. This can be accomplished only by subjecting each patient with pulmonary tuberculosis to regular laryngeal examination. I find that hoarseness, one of the early symptoms in cancer of the larynx, often develops in tuberculosis only after the larynx is already widely involved. Even an actual tuberculous involvement in one or both vocal cords may cause no noticeable change in the voice. I have frequently found the disease lodged around the epiglottis, the ventricular bands or the arytenoid cartilages without showing laryngeal symptoms for a long time. Therefore, at the slightest suggestion of laryngeal tuberculosis, thorough examination is indicated in order to determine the extent of a possible lesion.

There is a difference of opinion as to the best method to be applied when examining the larynx in order to save the patient unnecessary excitement and strain. There are two methods in use at the present time, the original indirect method with the laryngeal mirror and the so-called direct method, now largely in use, which was perfected by Chevalier Jackson of Philadelphia. Those who prefer the indirect, or mirror, method for both examination and treatment contend that the direct examination with illuminated metal tubes and similar instruments lays too great a strain on the debilitated patient with tuberculosis. I must agree that the indirect method is sufficient if the disease is in the first stage and is limited to one or both vocal cords. But after the disease has spread and when active treatment is required, it is inconceivable to me how one can reach every corner of the larynx for therapeutic purposes by means of the indirect method. My experience is that by the direct method it is often easier to examine the average patient with tuberculosis than patients who do not have tuberculosis, because many tuberculous patients are thin and asthenic, so that direct exposure of the larynx is often easily accomplished.

By lifting the epiglottis, an excellent view is gained of the whole interior of the larynx. Also, the tube can be introduced into the laryngeal ventricles, which gives one a close survey of this important anatomic region. Although the disease usually appears on one vocal cord or in the interarytenoid space, I have found that in many cases the disease develops in the ventricle and gradually spreads to the vocal cords and the ventricular bands. Close study of these parts can be accomplished only by direct laryngeal examination. Figure 1 *A* shows the mirror view of a lesion which is usually described as prolapse of the ventricle, and figure 1 *B* shows the direct exposure of the lesion. I think that the two pictures demonstrate clearly the difference between

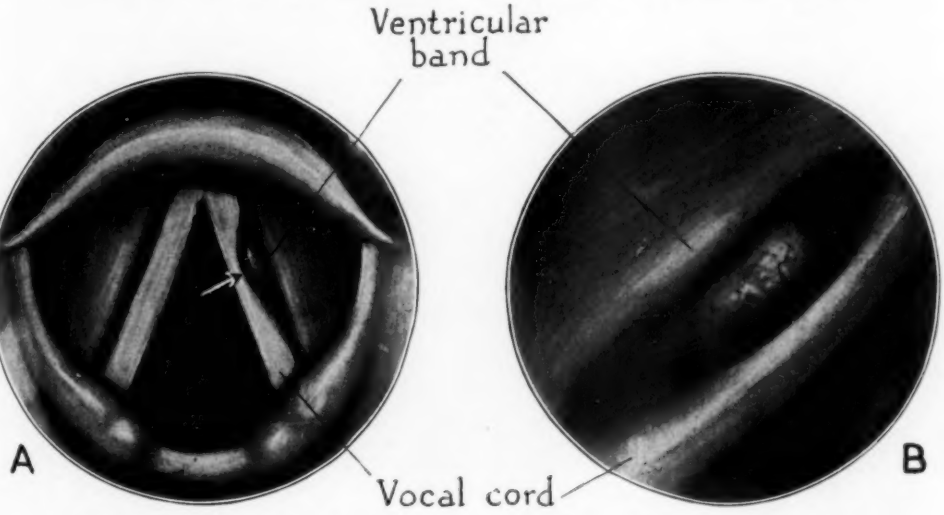

Fig. 1.—*A* shows the mirror view of a so-called prolapse or eversion of the left laryngeal ventricle. *B* shows a direct exposure of the left ventricle through the Jackson laryngoscope. The extension of the prolapse may be seen.

the methods. The lesion is seen to be much more extensive if the laryngoscopic tube is introduced directly into the ventricle by pushing aside the ventricular band. I do not need to explain that a biopsy specimen can be taken and treatment can be applied without difficulty when the lesion can be brought into view as clearly as is shown in figure 1 *B*.

This so-called prolapse of the larynx, also called eversion of the larynx by some authors, is frequently found to be the incipient stage of tuberculosis of the larynx. By direct examination of the laryngeal ventricle one is able to observe the gradual development of the disease in apparently normal larynges. First, a slight congestion and swelling of the mucosa are noticed at the interior of the ventricle. This slowly increases, and in some cases develops into a real tumor-like mass

(fig. 1). A biopsy made at this time shows the tuberculous condition of the tissue. In other cases the small lesion starts to ulcerate (fig. 2) and spreads gradually to the vocal cord or the ventricular band. I have noticed in a number of cases of ulceration around the vocal cords or ventricular bands that the condition started from lesions in the laryngeal ventricle. If every patient with tuberculosis were subjected to direct examination of the ventricle, I am sure that many incipient cases of tuberculosis of the larynx would be found in time to destroy the lesion at the beginning.

A striking example of how an extensive lesion can escape the view of the examining physician is given in figure 3. The patient had no

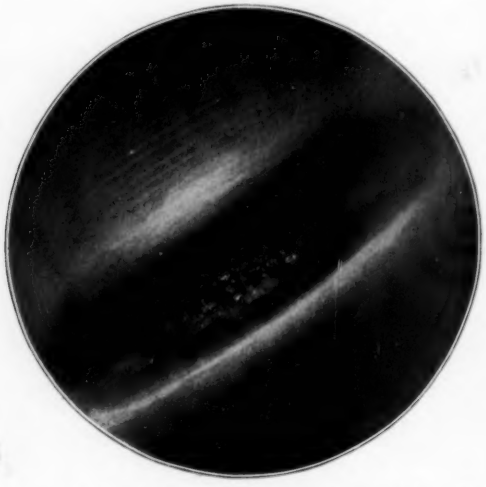

Fig. 2.—Direct exposure of the left laryngeal ventricle with incipient tuberculosis.

laryngeal symptoms, and the diagnosis was incipient tuberculosis of the larynx. The mirror view (fig. 3 *A*) shows only a slight swelling of the laryngeal surface of the epiglottis, while the direct exposure (fig. 3 *B*) shows advanced tuberculosis of the larynx. Figure 4 *A* is a mirror view of apparently nonulcerated incipient tuberculosis situated around the arytenoid cartilage, while close direct inspection with the laryngoscope (fig. 4 *B*) clearly revealed an ulceration on the laryngeal surface of the arytenoid cartilage extending to the vocal cord.

Although there is a possibility of disseminating tubercle bacilli into the surrounding tissue while taking a biopsy specimen, it is desirable to remove a piece of tissue from the diseased larynx to ascertain the nature of the lesion. To prevent dissemination, the area from which the section is taken should be cauterized subsequently. A diagnosis by exclusion would result in many a mistake. It is not unusual to find

cancer or syphilis of the larynx in a patient with pulmonary tuberculosis. It is well known that lesions of these three diseases (tuberculosis, cancer and syphilis) often resemble each other closely on gross examination. With the direct method and a fine straight cutting forceps it is easy to remove a small part of the diseased tissue, even from as small a

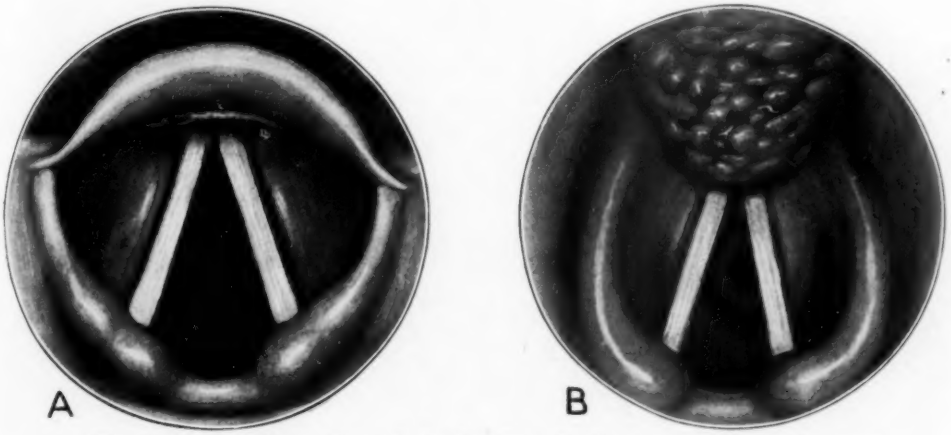

Fig. 3.—*A*, a mirror view of the larynx; *B*, direct exposure of the same larynx, showing an extensive lesion on the laryngeal surface of the epiglottis.

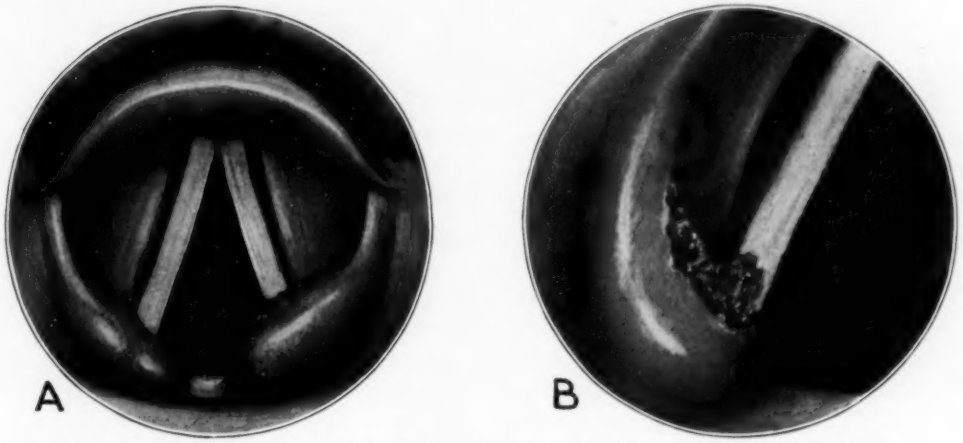

Fig. 4.—*A*, a mirror view of the larynx with the left arytenoid cartilage involved; *B*, direct exposure of the left arytenoid region, showing the extension of the lesion.

lesion as that seen in figure 2. If possible, the specimen should be taken from an ulcerated lesion. The incipient tuberculosis of the left vocal cord seen in the mirror view in figure 5 *A* did not show evidence of ulceration. By direct close exposure of the larynx and by pressing

on the vocal cord with the end of the tube, a long slitlike ulceration was revealed. Some of the granulation tissue was removed with a fine biopsy forceps without destroying the surrounding tissue of the vocal cord, thus insuring good function after adequate treatment, which led to complete cure.

In order to prevent severe pain on swallowing after the operation in cases of extensive involvement of the epiglottis (fig. 3), the specimen should be removed from the laryngeal surface of the epiglottis rather than from the upper or lateral edges, which face the tongue and the pharynx and are constantly touched by the food during deglutition.

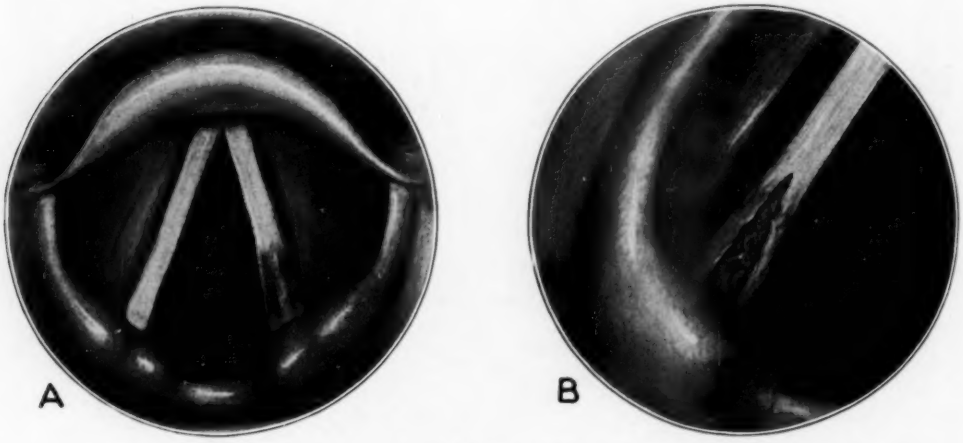

Fig. 5.—*A*, a mirrow view, showing the involvement of the left vocal cord; *B*, direct exposure of the left vocal cord, showing a slitlike ulcer.

TREATMENT

Local treatment of a tuberculous larynx is usually unsuccessful in a febrile, toxic patient with pulmonary tuberculosis, who has little general resistance and sputum containing many tubercle bacilli. On the other hand, an advanced pulmonary condition with cavitation in a patient with good general resistance (immunizing power) often responds to active local treatment of the larynx. There are borderline cases in which it is doubtful that the patient will respond to the treatment favorably or at all. In order to gain a clue as to the healing power of such a patient, I have found it helpful to make a trial puncture into the lesion with the electrocautery needle. If this preliminary puncture heals and scar tissue is apparent within one or two weeks, the response is favorable, and further local treatment is indicated. However, if healing is delayed or does not take place, the patient's resistance is low, and one must wait until treatment of the general condition has improved his resistance before giving further laryngeal treatment. In such a case

palliative measures, such as the instillation of oil (menthol or chaulmoogra oil) often relieves the symptoms temporarily.

Rest of the larynx is still advocated by many laryngologists. The patient is told not to talk loudly. I do not agree that this is a real rest, as the vocal cords are in motion whenever the patient whispers or breathes. I have seen good results from putting the larynx at complete rest by temporarily paralyzing the affected side by injecting alcohol in or around the recurrent laryngeal nerve (motor nerve).[2] This method, originated by Leichsenring, is not widely known. Figure 6 shows a condition suitable for this procedure; such unilateral lesions are most suitable for this method. The principle is the same as that employed when one puts a tuberculous joint at rest or causes the collapse of a

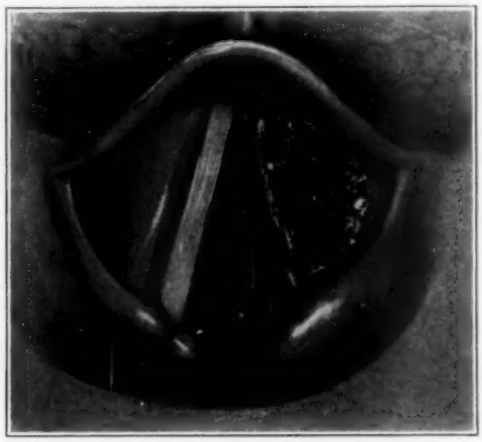

Fig. 6.—Mirror view, showing a unilateral tuberculous lesion on the left side suitable for curative paralysis of the recurrent laryngeal nerve.

lung by pneumothorax. The technic is comparatively simple. A straight needle (about 8 or 10 cm. long.) is pushed along the first tracheal ring to the vertebral column; then it is withdrawn for from 1 to 1.5 cm., and from 1 to 1.5 cc. of an 80 per cent solution of alcohol is injected. The paralysis of the recurrent nerve lasts, on the average, from about four to eight weeks, after which mobility of the vocal cord returns. If necessary, this "curative paralysis" may be repeated. The method cannot be applied on both sides at the same time.[3] However, it can be combined

2. Schugt, H. P.: Tuberculosis of the Larynx, Arch. Otolaryng. **4**:479 (Dec.) 1926; Weitere Erfahrungen mit der kurativen Rekurrenslaehmung (Leichsenring) bei Kehlkopftuberkulose, München. med. Wchnschr. **77**:626, 1930.

3. In some cases the paralyzed vocal cord assumes a so-called median position; if this happens in a case in which the curative paralysis is instituted on both sides simultaneously, dyspnea develops. For this reason the method should be used on only one side at a time.

with other kinds of treatment, such as galvanocautery or high frequency cauterization of the lesion.

Cauterization is of paramount value in the routine treatment of all such patients that require local treatment. Although recently high frequency cauterization has largely come into use, I still prefer the former method. The hot platinum tip is inserted into the lesion and kept there for a few seconds. Incipient lesions, such as small ulcers or tuberculous granulation tissue, are sometimes cured by one or two treatments, whereas, in more advanced conditions the treatment may have to be repeated frequently. By exposing the larynx directly with the Jackson laryngoscope, there is no difficulty in reaching every diseased spot in the larynx. If the lesion is extensive and involves the arytenoid cartilages, it is advisable first to destroy gradually all the diseased tissue around the cartilages. These often heal by gentle superficial cauterization. Deep cauterization of the arytenoid cartilages may produce perichondritis or lead to ankylosis of the crico-arytenoid joint and fixation of the cord. Isolated lesions in the epiglottis often yield better to cauterization than to resection of the whole epiglottis, an operation which should be restricted to tuberculous lesions around the upper border of the epiglottis. If the lesion has already spread to the root of the epiglottis the treatment is much more difficult. Large granulations, especially around the interarytenoid space, can be treated successfully by cauterization so that in many cases they disappear. Moreover, they can be removed with a laryngeal punch forceps, and the wound may then be cauterized. I have frequently seen cases in which granulations developed all over the larynx, causing an obstruction with severe dyspnea. I should like to sound a warning against performing a tracheotomy in such cases, as many of the patients have infectious sputum, in which condition the healing of the tracheostoma is indefinitely delayed or often does not take place at all. It may result in a large gaping wound which is always reinfected by the sputum and which infects the neighboring tissue. In cases in which there is laryngeal obstruction from tuberculous granulations, it is best to try to resect the diseased tissue through a Jackson laryngoscope with punch forceps and then to follow up with routine treatment. Some authors advocate tracheotomy to put the larynx at rest. This should be done only if the sputum is free from tubercle bacilli. I should never perform a tracheotomy for such a purpose, and I believe that most laryngologists have abandoned this method.

Although the main object of this presentation is to consider the surgical treatment of laryngeal tuberculosis, I feel that I should say a few words about the nonsurgical ways of treating the condition, as they are so intimately connected with the surgical procedures. The instillation of an oily solution, such as menthol or chaulmoogra oil, is widely

used and gives the patient temporary relief from local distress, such as dryness in the pharynx and larynx, but I have not noticed any healing power in these medications. The local application of silver nitrate, lactic acid and the like may cure superficial ulcerations in some cases but is useless in more advanced stages with granulation tissue and large ulcerations. At present, indirect and direct irradiation of the laryngeal lesions with ultraviolet rays are being used, and no doubt show good results in some cases. The direct method of irradiation of the larynx was first worked out in Vienna and has been used in this country.[4] Direct irradiation, however, can be used only in a limited number of cases, and it is still an open question whether the patients would not be benefited just as much by general irradiation of the same kind.

Treatment of Dysphagia.—There remain, unfortunately, a number of patients in whom the condition cannot be improved either by conservative or by surgical procedure. In this group are the patients with so little resistance in the beginning of the disease that despite the treatment of both the pulmonary and the laryngeal condition a steady advance of the disease can be noted from week to week. In these patients the larynx rapidly presents the gravest symptoms. Extensive ulcerations form, and there is unbearable pain on swallowing (dysphagia). To relieve the pain is the duty of the physician. It presents a veritable problem. I have seen patients who refused to eat for weeks rather than endure the excruciating pain caused by deglutition.

In some cases the pain can be relieved by routine treatment: electrocautery; resection of the diseased parts of the larynx; instillation of various solutions, such as cocaine, menthol and chaulmoogra oil, or the administration of anesthetizing preparations of ethyl aminobenzoate [5] and orthoform. Most of these treatments are suitable for only a short time. It is my experience, however, that one can do much more for this condition than is generally done in many institutions where the patients are kept constantly under the influence of morphine, cocaine or similar drugs. Effective measures to destroy the pain must be used in order to enable the patient to eat regularly and to build up his general condition. Pain on swallowing is an early symptom of a tuberculous condition in the larynx and is almost pathognomonic. The pain develops when the disease involves the epiglottis, the arytenoid cartilages or the aryepiglottic folds, as these are most exposed to irritation in the act of deglutition. The pain is most severe when the ulcerations have spread to both sides.

4. Miller, Joseph: Artificial Sunlight in the Treatment of Laryngeal Tuberculosis, Arch. Otolaryng. **13**:326 (March) 1931.

5. Schugt, H. P.: A New Mouth and Throat Anesthetic for Control of Pain, M. J. & Rec. **134**:453 (Nov. 4) 1931.

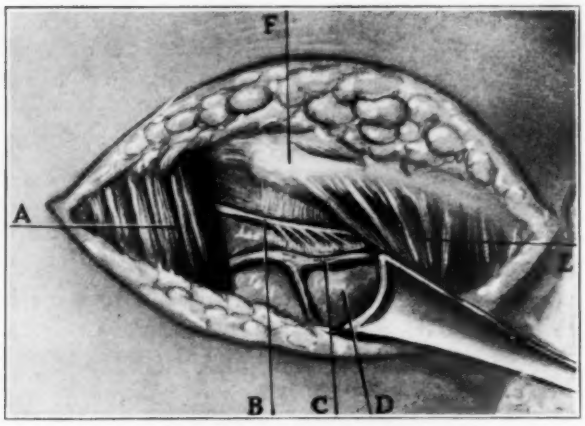

Fig. 7.—Drawing showing the fanlike distribution of the superior laryngeal nerve on the thyrohyoid membrane: *A*, the sternocleidomastoid muscle; *B*, the superior laryngeal nerve; *C*, the superior laryngeal artery; *D*, the thyroid cartilage; *E*, the omohyoid and the sternohyoid muscle, and *F*, the hyoid bone.

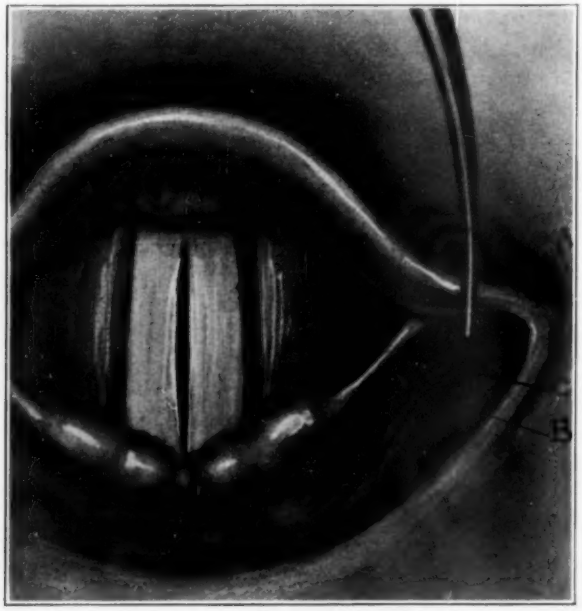

Fig. 8.—The left pyriform sinus, unusually shallow, showing the superior laryngeal nerve (*C*). *A* represents the plica pharyngo-epiglottica, and *B*, the plica aryepiglottica.

In previous publications I have described in detail the surgical methods that can be used in treating the pain of swallowing in the tuberculous larynx. Therefore, I shall give only a brief outline of the operations now in use, which I worked out on the large number of patients under treatment. The most efficient way to bring about complete anesthesia in the larynx is to paralyze the sensory nerve of the larynx, the superior laryngeal nerve. This was first done by Hoffmann.[6] Figure 7 shows the superior laryngeal nerve running on the thyrohyoid membrane between the thyroid and the hyoid cartilage; the nerve can easily be blocked by inserting a medium-sized needle

Fig. 9.—The normal appearance of the pyriform sinus.

through the skin into the space between the hyoid and the thyroid cartilage. After the thyrohyoid membrane is reached and the area is probed a sharp pain is felt in the ear on the affected side, which indicates that the nerve is struck. From 1 to 2 cc. of an 80 per cent solution of alcohol is then injected, and complete anesthesia of the injected side is accomplished which lasts for several weeks. This method has proved highly satisfactory in most of my cases. I have worked out another method,[7] by which the nerve can be reached on its course

6. Hoffmann, R.: Daueranesthesie im tuberkulösen Kehlkopf, München. med. Wchnschr. **55**:739 (April 7) 1908.

7. Schugt, H. P.: Superior Laryngeal Nerve Block Anesthesia via the Pyriform Sinus in Tuberculosis of the Larynx, Am. J. Surg. **7**:659, 1929

through the pyriform sinus. With a curved laryngeal needle one can block this nerve in the aforementioned fossa. Figure 8 shows the nerve in its course through the pyriform sinus; it shows an unusually wide and shallow pyriform sinus, that of a very emaciated tuberculous patient; the nerve could be seen through the mucosa. Figure 9 shows the sinus as it appears in the average person. It is not necessary to see the nerve in order to reach and paralyze it. I have used this method on a number of patients when the external method just described did not give satisfactory results.

Some authors advocate the resection of the superior laryngeal nerve from the outside. Figure 7 shows where the nerve can be found by

Fig. 10.—Laryngeal tuberculosis extending to the lingual surface of the epiglottis and the right lateral pharyngeal wall.

making an incision between the hyoid and thyroid cartilages.[8] It is my opinion that one should perform this operation only on patients in fairly good general condition and only if the previously described methods of blocking the superior laryngeal nerve with alcohol are not successful.

The aforementioned methods have little effect in cases in which the disease has spread from the larynx to the adjoining tissues, to the lingual surface of the epiglottis or to the base of the tongue, areas which are not supplied by the superior laryngeal nerve. Figure 10 shows a larynx in which the lesion has reached the neighboring tissue of the larynx and the lateral wall of the pharynx, spreading over the tonsils and pharyngeal pillars. I have seen similar cases with ulcera-

8. Schugt, H. P., in Ballinger, W. L.: Diseases of the Nose, Throat and Ear, Medical and Surgical, ed. 6, Philadelphia, Lea & Febiger, 1930, p. 736.

tions in the nasopharynx. I do not need to explain that the pain these patients suffer is agonizing. Such lesions are usually found in the hopelessly advanced cases. To relieve the suffering is always a problem which taxes the physician to the utmost. I have succeeded in working out a simple method by which a complete and lasting anesthesia is brought about in these parts of the pharynx.[9] The pharynx is supplied by the so-called pharyngeal plexus, located in the parapharyngeal space. It is composed of branches from the vagus, glossopharyngeal and sympathetic nerves. To produce anesthesia in

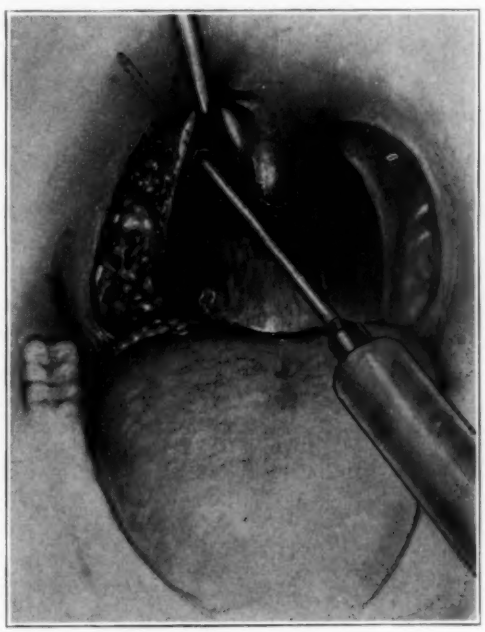

Fig. 11.—The same tuberculous lesion as shown in figure 9, continuing over the right tonsil, the pillars and the pharynx. The needle is inserted for blocking the pharyngeal plexus.

a case of dysphagia from pharyngeal tuberculosis, one must block this plexus. This is accomplished as follows: A slightly curved needle is inserted beneath the pharyngeal mucosa at a point directly behind the posterior pillar on a level with the base of the uvula (fig. 11). The needle is then passed upward and laterally about 1.5 cm. This is a delicate movement which calls for some caution to avoid penetrating the long muscles of the neck. On reaching the parapharyngeal space, the needle

9. Schugt, H. P.: Tuberculosis of the Pharynx: Blocking of the Pharyngeal Nerve Plexus for the Relief of Pain: A New Method, M. J. & Rec. **136**:24 (July 6) 1932.

should be easily movable in all directions, as any resistance indicates that the muscular tissue has been penetrated. I have found that 1.5 cc. of diluted alcohol produces satisfactory results. I commence with a 35 per cent solution, which often proves too weak to produce lasting anesthesia. The strength is then increased gradually (from a 45 to a 50 per cent solution of alcohol) at intervals of a day until I have a suitable solution to meet the requirements of the individual case. I wish to sound a note of warning here that the injection of too strong a solution of alcohol may result in the complete paralysis of some of the muscles involved in deglutition. Such complications lasting for a period of one or two weeks followed a few of my earliest treatments, but they are, of course, uncalled for and can readily be avoided by following the described procedure. Mild paralysis of these muscles may at times follow the injection of a solution of proper strength. However, this is only a temporary condition which disappears within one or two days.

I do not wish to imply that this is the sole method of providing relief from dysphagia in cases of pharyngeal tuberculosis, nor should it be employed promiscuously. However, in cases in which blocking of the pharyngeal nerves is indicated, the procedure assures a more complete and lasting control of this distressing symptom than may be attained by other methods.

Before concluding this presentation I wish to say something about tuberculosis of the oral cavity. There one usually finds the lesions in the form of ulcerations in the mucosa of the cheek and the tongue. These can easily be excised and the small wound sutured. On the addition of other conservative treatment, such as the application of lactic acid or silver nitrate or ultraviolet irradiation, the lesions may heal completely. However, in patients with advanced pulmonary tuberculosis I have often seen such ulcer spread despite all kinds of treatments. In one patient the lesion extended from the tip to the root of the tongue. Owing to unbearable pain in the tongue, the patient finally was unable to swallow even soft-boiled eggs. Fortunately, such cases are rare. The anterior portion of the tongue is supplied by the lingual nerve. In order to kill the pain in this area, one may block this nerve by injecting alcohol into it. This method was described by Skillern.[10] The nerve can be felt as a cord the size of a match-stick just internal to the pterygomandibular ligament below and behind the last molar tooth, under the mucous membrane. That the needle has entered the nerve is determined by an immediate paresthesia in the tongue. However, I have not found this method entirely effective and prefer,

10. Skillern, P. G.: Infiltration of Lingual Nerve for Operations Upon the Tongue and for Relief of Pain in Inoperable Carcinoma, Surg., Gynec. & Obst. **17**:114, 1913.

in obstinate cases, to resect the nerve from the outside, as is advocated for cancer of the tongue with severe pain. Resection gave immediate relief to the patient mentioned earlier, so that he was able to swallow with comfort.

SUMMARY

Tuberculosis of the larynx is curable in persons with good general resistance. Close cooperation with the general practitioner and the surgeon is necessary before local treatment of the larynx is started. Direct laryngoscopy for a correct diagnosis is preferable to indirect examination with a mirror. Emphasis is laid on the importance of the laryngeal ventricle in incipient cases of laryngeal tuberculosis. A preliminary puncture with the galvanocautery tip is valuable in ascertaining the healing power of the patient. Electrocautery is of great value in the routine treatment of the tuberculous larynx. The curative paralysis in one-sided involvement is a valuable method, although little is known of it. In cases of laryngeal obstruction from tuberculous lesions tracheotomy should be avoided and replaced by direct intralaryngeal operations. In treating dysphagia (pain in swallowing), blocking of the superior laryngeal nerve is the method of choice. Ordinarily, this is done from the outside. The nerve can also be blocked from the inside through the pyriform sinus. Resection of the nerve should be limited to patients in good general condition. In cases of pharyngeal tuberculosis severe pain can be dealt with by blocking the pharyngeal nerve plexus. Small lesions in the mouth can be excised and treated locally with success. In advanced cases of lingual tuberculosis with severe pain, conservative treatment may be useless. The pain in this area can be destroyed either by blocking the lingual nerve with alcohol intra-orally or by resecting the nerve from the outside.

CARCINOMA OF THE TRACHEA

REVIEW OF RECENT LITERATURE AND REPORT OF A CASE

FRED STENN, M.D.
CHICAGO

Owing to the more extensive use of the bronchoscope and the more frequent performance of necropsy, cases of carcinoma of the trachea are being reported less seldom. Perusal of the literature reveals this lesion to be rare; it is observed, however, in about 0.004 per cent of all autopsies. Broman,[1] D'Aunoy and Zoeller[2] and Figi[3] have written excellent articles on this condition during the past ten years. The case here reported[4] is the first encountered at Billings Hospital; it is significant because of the typical course, the ulceration of the tumor into the esophagus and the absence of recognizable malignant cells in the postmortem specimen after roentgen therapy.

INCIDENCE

In 5,063 autopsies Fraenkel[5] found 7 cases of primary carcinoma of the trachea and 27 of primary malignant lesions of the larynx. Analyzing 700 cases of cancer at the University of Jena, Bilz[6] found 14 to be of laryngeal, but none of tracheal, origin. Bejachs[7] found the condition to be primary in the trachea in none of 1,301 necropsies performed on patients with cancer at the Berlin Charité. In her analysis of the literature, Broman mentioned the work of Reichelman, who reported no cases of this condition in 711 autopsies performed on patients with cancer; Redlich reported 1 case in 496 autopsies; Feilchenfeld, 2 in 507, and Mielechki, none in 560. During the last sixteen years 470 cases of carcinoma of the larynx have been seen at the Mayo Clinic, and only 5 have been primary in the trachea. D'Aunoy and Zoeller remarked that at the

From the Department of Pathology, the University of Chicago.

1. Broman, J. R.: Primary Carcinoma of the Trachea, J. Cancer Research **8**:394 (Oct.) 1924.
2. D'Aunoy, R., and Zoeller, A.: Primary Tumors of the Trachea, Arch. Path. **11**:589 (April) 1931.
3. Figi, F. A.: Primary Carcinoma of the Trachea, Arch. Otolaryng. **12**:446 (Oct.) 1930.
4. Dr. Gordon Scott of the Throat, Nose and Ear Department of Billings Hospital gave permission to report this case.
5. Fraenkel, E.: Cancer of the Trachea, Deutsches Arch. f. klin. Med. **135**: 184 (Feb.) 1921.
6. Bilz, G.: Ztschr. f. Krebsforsch. **19**:282, 1923
7. Bejachs: Ztschr. f. Krebsforsch. **16**:159, 1917.

Pathologic Institute at Basle over a period of thirty-five years 1 tracheal and 9 laryngeal tumors were found among 1,078 malignant growths, and they also noted at the Charity Hospital of New Orleans, from 1906 to 1929, 1 tracheal and 68 laryngeal tumors. These authors culled from the literature a total of 91 instances of carcinoma of the trachea.

Herbert Lund [8] has just completed a survey of cases in the records of postmortem examinations of the Philadelphia General Hospital from 1867 to 1934; in the 25,000 autopsies only 2 cases of primary cancer of the trachea were encountered. Symmers [9] reported no record of carcinoma of the trachea at the Bellevue Hospital, New York. In 12,000 autopsies at the Los Angeles County Hospital, Evans[10] also failed to find the record of any such tumor, and in 5,000 autopsies at Guy's Hospital, London, Wright,[11] similarly, found no record of this condition. H. G. Wells has seen 2 cases of this condition in his experience. R. H. Jaffé [12] observed 1 during the last six years at Cook County Hospital, Chicago.

PATHOLOGY

In their review of the literature D'Aunoy and Zoeller found that the ratio of occurrence of the recorded tumors in accordance with sex is 2.3 males to 1 female, and according to Broman it is 1.6 males to 1 female. The ages of the patient vary between 21 and 90, the age of greatest frequency being between 50 and 60 years. The tumor occurs twice as frequently on the posterior wall of the trachea as on the anterior wall, and two and one-half times more frequently in the lower third of the trachea than in the upper third. Strauss [13] expressed the belief that the frequency of involvement of the posterior wall is due to the drainage of lymph posteriorly; von Bruns and Schrotter attributed it to the predominance of glandular epithelium on the posterior wall, in contrast to the cartilaginous nature of the anterior wall, where such tissue is not abundant. Simmel stated that the lower third of the trachea (at the bifurcation) is most exposed to trauma. It is only occasionally that the tumor encircles the organ. Metastases occur in more than half of the total number of cases, especially to the esophagus, liver, spleen, pancreas and kidneys and, more rarely, to the lungs, bones and colon; in this respect the tumor is in sharp contrast to carcinoma of the larynx, which seldom metastasizes.

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8. Lund, Herbert: Personal communication to Dr. J. H. Clark, Director of Laboratories, Philadelphia General Hospital.
9. Symmers: Personal communication to the author.
10. Evans: Personal communication to the author.
11. Wright: Personal communication to the author.
12. Jaffé, R. H.: Personal communication to the author.
13. Strauss, J. F.: Ann. Otol., Rhin. & Laryng. **31**:715, 1922.

The histologic structure of this tumor includes adenocarcinoma, papillary carcinoma, columnar cell carcinoma, cylindric cell carcinoma, scirrhous carcinoma, carcinomatous degeneration of tracheal mucous glands and epithelioma. Glandular carcinoma is the predominant type reported, though many of the cases appearing in the literature are not easily classified. Some pathologists (von Langhans, Hamacher and Virchow) have adhered to the view that the histogenesis rests in the mucous glands, and others, to the conception of enclavements of embryonal cells, particularly in the esophageal epithelium.[14]

BRONCHOSCOPIC APPEARANCE AND SYMPTOMS

The appearance of the tumor through the bronchoscope depends on its age and degree of malignancy. Early it may be a tiny sessile papilloma, growing to an ulcerative fungating mass which often almost completely occludes the lumen. In other instances it is flat, smooth-surfaced and slow-growing, ultimately penetrating the adjacent tissues and sometimes ulcerating to produce a tracheo-esophageal fistula, as in the case described later.

Usually, the first sympton is tickling in the trachea, followed by an irritating, less often paroxysmal, cough and persistent hoarseness (due to pressure of the enlarged lymph glands on the recurrent laryngeal nerve). Loss of weight, chills and vomiting become prominent. Expectoration of blood, fresh or clotted, is a late symptom, and dyspnea and cyanosis indicate narrowing of the lumen. Figi emphasized the importance of differentiating asthma, thyroid disease, empyema, bronchiectasis and pulmonary abscess from tumor of the trachea.

The prognosis, of course, is bad, regardless of location, though tumors located in the upper third of the trachea lend themselves to tracheal resection. Radium and diathermy, administered through the bronchoscope, have given promising results. In some hands roentgen therapy has been beneficial.

REPORT OF CASE

Clinical History.—In April 1933, a thin man, aged 55, a storekeeper by trade, became unable to swallow liquid as well as solid foods and complained of pain in the throat during deglutition. Bronchoscopy was performed in October, and a broad-based cauliflower-like mass on the posterior wall of the trachea was observed. Under the fluoroscope esophageal bougienage and barium sulphate showed obstruction in the esophagus at the suprasternal notch, but esophagoscopy revealed no tumor in this region. In December the mass seemed to subside; wheezing respiration developed, and at this time bronchoscopy revealed the growth confined to the posterior tracheal wall, 1 cm. in height, at the level of the suprasternal notch. The biopsy specimen from the tracheal growth showed masses

14. Daland, J., and McFarland, J.: Primary Malignant Endotracheal Tumor; Preliminary Report, J. A. M. A. **63**:647 (Sept. 3) 1904.

Fig. 1.—Lateral roentgen view of the neck, showing the narrowed lumen of the trachea.

Fig. 2.—Constriction at the suprasternal notch, revealed by barium sulphate in the esophagus.

of large vesicular and oval malignant cells, closely packed together; the cytoplasm was basophilic, and occasional mitoses were present. Only a thin reticulum supported the cell masses. Roentgen therapy was begun, 8,000 r units (roentgens) being given. To ascertain better the nature of this tracheal tumor, visualization was accomplished on December 24, using an iodized and chlorinated peanut oil. On December 30, six days later, the patient had a severe chill, felt weak, vomited and expectorated bloody sputum. Pneumonia of the lower lobe of the right lung was diagnosed, and Pneumococcus type III was isolated from the sputum. The apex and lower lobe of the right lung became involved two weeks later. The

Fig. 3.—Gross specimen of the trachea, illustrating the extent of tumor growth and the tracheo-esophageal fistula. Fracture of tracheal cartilages is seen.

temperature continued high, and the condition of the lung failed to clear. On March 3, dyspnea and cyanosis became marked, and the mass was found to obstruct the trachea almost completely. Tracheotomy was performed. The febrile course continued; death occurred on March 18, 1934. Pneumococcus type III was cultured from the blood. The hemoglobin dropped from 84 to 40 per cent, the red cell count from 3,850,000 to 3,120,000 and the white cell count from 13,800 to 4,800. The clinical diagnosis was carcinoma of the trachea, with compression of the esophagus and unresolved pneumonia of the lower lobe of the right lung.

Macroscopic Observations at Autopsy.—In relation to the tumor, the observations at autopsy were as follows: The body was that of an emaciated man aged 55, with a gray-yellow pallor of the skin. There was no palpable lymphadenopathy. An area of roentgen ray pigmentation and induration measuring 10 cm. in diameter was present over the lower aspect of the neck and the manubrium sterni. Immediately above the suprasternal notch was a tracheotomy opening 5 cm. in diameter, the walls of which were friable, dirty black and gray and had a putrid smell. Examination of the larynx and trachea revealed an extensive necrotic ulcerative process beginning 2 cm. inferior to the true vocal cords, stretching down 5.5 cm. and occupying the anterior, lateral and posterior aspects of the tracheal wall. Anteriorly, the lesions extended through the skin,

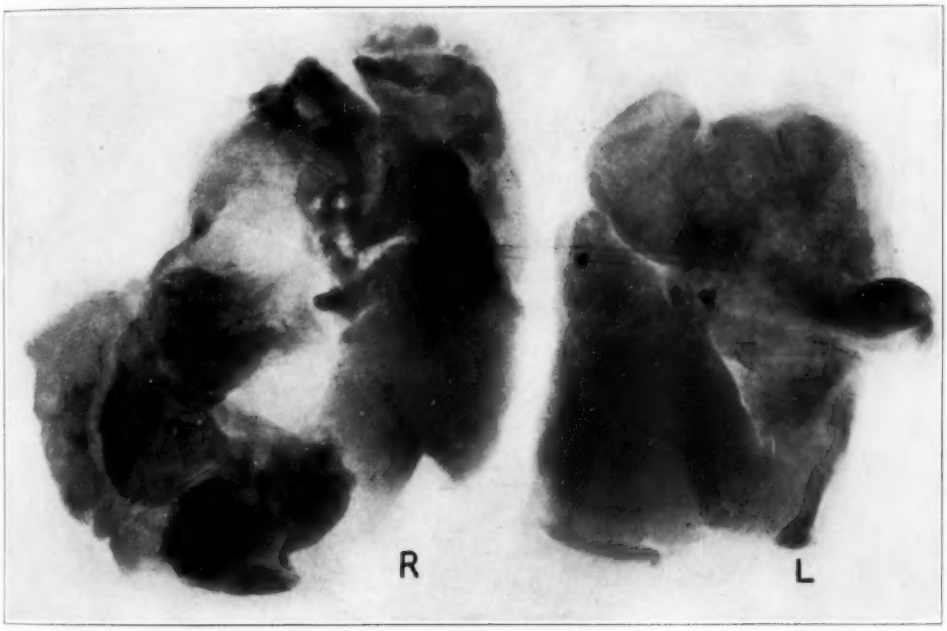

Fig. 4.—Roentgenogram of the lungs taken post mortem, showing fine opaque stippling due to iodized and chlorinated peanut oil.

and posteriorly they ulcerated through the esophagus, forming an orifice 1.5 by 3.5 cm. The tumor was very soft, friable, dirty black and gray, of a ragged appearance, and had a gangrenous odor. The thyroid gland, muscles, arteries and veins in this region were matted to the thyroid cartilage. The upper tracheal cartilages were eroded, and many lay free in the ulcerated area. The paratracheal glands were hyperplastic, measuring from 1 to 2 cm. in diameter, and in section were tar-black; several were speckled with gray spots. At the level of the suprasternal notch the esophagus presented a ragged opening, anteriorly walled by dirty gray-blue necrotic tissue extending posteriorly. Its lumen was distinctly narrowed but not occluded and elsewhere was normal. The thyroid and thymus were necrotic and discolored and were embedded in the dense paratracheal mass. No metastases were observed in any of the viscera.

The left pleural cavity contained a moderate amount of yellow-green fluid, and the right was obliterated by easily torn fibrous bands of connective tissue. The lower lobe, the posterior part of the middle lobe and patchy areas of the upper lobe of the right lung were consolidated. The lower lobe of the left lung was entirely hepatized. Some purulent material could be expressed from the small bronchi.

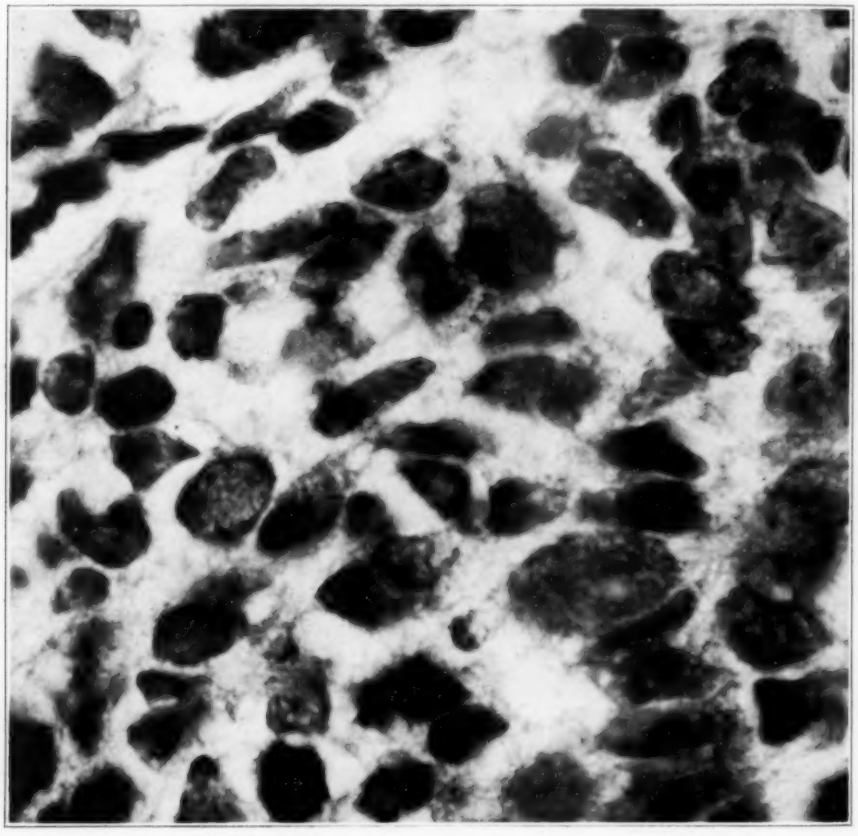

Fig. 5.—Section through a biopsy specimen of the tracheal tumor, showing large oval and vesicular malignant cells distributed throughout a delicate reticulum.

Report of Bacteriologic Examination.—Culture of material from the involved pulmonary lobes showed hemolytic streptococci, Streptococcus viridans, Staphylococcus albus and Staphylococcus aureus.

Roentgenograms of the lungs taken post mortem showed fine but dense opaque spots sprinkled diffusely throughout the consolidated portion (iodized and chlorinated peanut oil) but no evidence of tumor metastases.

Histologic Observations.—Trachea: Sections through the margins of the tumor as removed at autopsy showed necrosis involving the entire wall. Scattered sparsely throughout were nuclei, mononuclear cells, lymphocytes and occasional

polymorphonuclear leukocytes. In places where the epithelium was intact it was of the stratified cylindric cell type. The cells lining the submucous glands were indistinct, and the areolar connective tissue in which they were embedded was loose. The muscle fibers were entirely hyalinized. None of the carcinoma tissue, such as that observed in the biopsy specimen, could be recognized in the postmortem specimen, all having been destroyed by radiation.

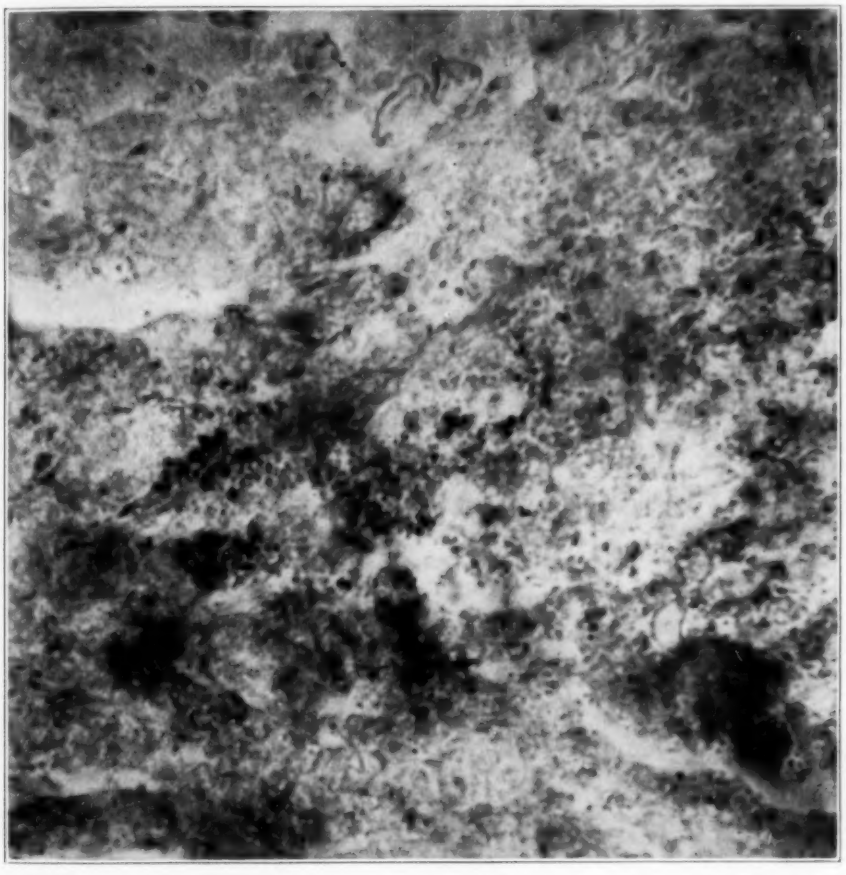

Fig. 6.—Section through a postmortem specimen of the tracheal tumor, showing extensive necrosis due to irradiation. Hyalinization and pyknosis are marked. Occasional polymorphonuclear leukocytes are seen. There are no tumor cells.

Lung: The pleura was much thickened and contained many dilated blood vessels which were distended with blood elements. In some areas the alveoli were filled thickly with polymorphonuclears, forming minute abscesses; in these they were replaced by a loose deposit of connective tissue in which lay many mononuclear cells, and in still other areas the septums were edematous, containing lymphocytes, plasma cells and occasional polymorphonuclears. A few corpora amylacea were seen in the alveoli. No distention of the capillaries or small blood vessels was seen. The bronchi were full of polymorphonuclear leukocytes. Emphysema was observed in some places. No tumor cells were visible.

Fat stains (scarlet red) of the pneumonic area of the lung revealed much fat in the alveoli (iodized and chlorinated peanut oil).

Paratracheal and Parabronchial Lymph Nodes: These nodes were hyperplastic, showing large numbers of histiocytes, and particles of coal pigment were numerous in the parabronchial nodes. No tumor cells were seen.

Anatomic Diagnosis.—The anatomic diagnosis was primary carcinoma of the trachea with complete destruction of cancer tissue by the roentgen rays and ulceration, hyperemia, edema and necrosis of the trachea with perforation into the esophagus; partial stenosis of the esophagus; unresolved pneumonia involving the upper and middle lobes of the right and left lungs; early fibrous pleuritis; hydrothorax of the left lung; brown atrophy of the heart; atherosclerosis of the aorta; parenchymatous degeneration of the liver and kidneys; arteriosclerotic scars in the left kidney, anthracosis of the lungs; icterus; fatty liver; tracheotomy opening; roentgen ray dermatitis over the neck; papilloma of the left thigh, and linear scars over the arm and neck.

The evidence that this tumor was primary in the trachea and not in the esophagus consists in the following facts: Clinically repeated esophagoscopy failed to reveal a mass in the esophagus early in the disease, whereas the mass was distinctly seen through the bronchoscope in the upper part of the trachea. In addition, at necropsy, not only did the tumor show definite signs of extension from the trachea into the esophagus, but the eroded tracheal cartilages projected out like ribs, remaining free in the ulcerated area, a condition, according to H. G. Wells, seen prominently in cases of advanced primary tracheal neoplasm.

SUMMARY

A brief review of the most recent literature on carcinoma of the trachea is presented, with the report of a case of a 55 year old man who died of primary carcinoma of the trachea, with ulceration into the esophagus, and lobar pneumonia.

RHINOSCLEROMA

REPORT OF TWO CASES

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In 1870 Hebra first described rhinoscleroma as a clinical entity, and six years later Mikulicz made careful pathologic studies of the disease. In 1882 Frisch discovered and isolated the causative organism.

In 1923 Figi and Thompson [1] presented a report on rhinoscleroma; this report is comprehensive as to the bacteriologic and pathologic phases and the course of the disease and also gives an extensive bibliography. Up to the time of that report there had been only six proved cases of rhinoscleroma at the Mayo Clinic in eight and a half years.

The disease is most common in Russia and in Austria, where it is endemic, and the greater part of the literature concerns cases which occurred in these countries. Cases occur practically all over the world and have been reported as sporadic, but they appear to have been most frequent among Poles, Russians and Austrians. In 1925 twenty-three cases, occurring mainly in natives, were reported in Central America. Lasagna reported that the disease had been noted in fifteen Italians, nearly all members of the same household. Figi and Thompson's report includes one case occurring in a native American, who had never been outside of the United States, and mentions one other, occurring in a Negro who was a native of America. The second case had been previously reported.

The disease generally occurs in persons of middle age, but it has been reported in children and in aged persons. It is impossible to determine the onset of the disease, for the course is so insidious that it may progress to a great degree without causing disability. Constitutional symptoms are rare.

The first lesions of scleroma may appear in any part of the upper respiratory tract, but as a rule the nares are first affected. From this point, the disease spreads, very slowly, throughout the contiguous membranes, and may finally involve the nares, the pharynx, the larynx and the trachea.

According to Figi and Thompson, the lesions appear at first as edematous blue-red nodules. When they occur in the nares, these

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From the Otolaryngological Department, Montefiore Hospital for Chronic Diseases.

1. Figi, F. A., and Thompson, L.: Rhinoscleroma, J. A. M. A. **91**:637 (Sept. 1) 1928.

lesions may form large ulcerated masses which protrude from the nares, as in Ballin's [2] case. Later in the disease the productive process ceases, sclerosis begins and the nodules become hard and lighter. The mucosa then becomes scarred and atrophic. These changes cause a marked narrowing of the nares, and the vestibule is frequently entirely closed.

The symptoms of scleroma depend on the location of the disease and on the progress which has been made before the patient comes under observation.

When the nares are affected there is frequently an enlargement in the size of the nose, with masses projecting from the orifices and nasal obstruction. There is a nasal discharge, and when ulceration is present this may be foul and even suggestive of a malignant condition. When there are no tumor formations the nares are rigid and considerably narrowed.

When the pharynx is affected there is marked dryness, and obstructive bands frequently form between the palate and the lateral pharyngeal walls, at times almost closing off the nasopharynx from the oropharynx.

When the disease has involved the larynx the symptoms are those of obstruction and irritation. Hoarseness, dyspnea and coughing, all of which may be very severe, appear early and are slowly progressive. There is little or no pain. The larynx may be almost immobile, with very slight movement of the vocal cords. Large tumor-like masses are often present; these are pale and rounded and do not resemble malignant growths or the lesions of tuberculosis. As the laryngeal lesions progress, the larynx and the trachea become boardlike in consistency.

As a rule the diagnosis is easily made by examination. When masses are present and a biopsy is performed the microscopic picture is conclusive.

The careful researches of Jonathan Wright,[3] both chemical and pathologic, are worthy of note, as is also his description of the microscopic picture. He wrote:

> Large extents of organized granulation tissue, filled with cellular products of inflammation, show very little of the nuclear fragmentation and no areas of coagulation necrosis characteristic of syphilis or tuberculosis. From this examination, lues, tuberculosis and simple inflammation may be ruled out. Large areas of so called foam cells are seen, whose cystoplasm between the nucleus and the periphery, marked distinctly by a cell membrane, has fallen away, leaving granules and threads which give the areas a peculiar lace-like appearance (Mikulicz). Here and there thru this kind of tissue are larger or smaller globular bodies which are usually called hyaline degeneration bodies (or Russel bodies). Numerous eosinophiles are seen in the diseased areas.

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2. Ballin, M. J.: A Case of Rhinoscleroma Treated with the X-Ray, New York M. J. **85**:490 (March 16) 1907.

3. Wright, J., and Strong, L. W.: New York M. J. **153**:517 (March 18) 1911.

The treatment of scleroma, up to the time roentgen ray and radium therapy began to be used, was completely unsatisfactory. Arsenic, mercury, iodine and antimony were among the favored remedies, but the results reported were entirely unfavorable. Vaccines apparently gave more satisfactory results, and improvement was noted in one case after an attack of erysipelas. Cautery has been used and discarded.

Ballin [2] in 1919 reported the use of roentgen therapy in a case of scleroma, and since then there have been many encouraging reports regarding treatment with roentgen rays and radium. The immediate response to treatment with roentgen rays is striking, the lesions clearing and the induration disappearing rapidly.

It may be necessary at times to remove obstructive bands and adhesions surgically before instituting treatment with roentgen rays, and in cases in which the laryngeal lesion is far advanced and the dyspnea marked, tracheotomy may be indicated either before or during the treatment.

It is of the utmost importance to bear in mind that no surgical intervention should be attempted unless it is followed rapidly with roentgen therapy, for the lesions recur rapidly, and large cicatrices develop which may be more obstructive than the original lesions. No operative procedure should be employed for the nasal obstruction; the submucous resection is contraindicated.

A complete return to normal is not to be expected from treatment with roentgen rays, for permanent changes are often present, but the progress of the disease is arrested, and the improvement in physical signs and symptoms is marked. It is necessary to keep the patient under observation, and treatment is indicated when there is any return of symptoms or when new physical signs of progress of the disease appear.

REPORT OF CASES

CASE 1.—J. B., aged 33, a Russian, was admitted to the Montefiore Hospital for Chronic Diseases on Jan. 22, 1931. He had been in the United States for sixteen years.

His chief complaint on admission was shortness of breath and difficulty in swallowing, which had become progressively worse for six months. His illness had begun eight years before with hoarseness, which was persistent. Three years later he was operated on; the tonsils and uvula were removed, and his throat "stretched." He improved after this and had no discomfort except for nasal obstruction and a yellowish expectoration.

In 1929 the patient was treated at the New York Post-Graduate Medical School and Hospital, where a biopsy was done and the diagnosis of rhinoscleroma was made. He was given several series of treatments with radium, and after each course of treatment he improved and his symptoms temporarily cleared. Six months before admission to the Montefiore Hospital for Chronic Diseases dyspnea and dysphagia again developed. After another series of treatments with radium the symptoms improved, but the patient lost a great deal of weight.

On examination, on Jan. 22, 1931, there was a marked hardening of the nose. It was almost boardlike, and the tip could not be moved. The left naris was completely occluded, partly by a marked deflection of the septum and partly by a narrowing of the vestibule. The uvula was absent, and a purulent discharge was present in the nasopharynx. The soft palate was thickened. The arytenoid cartilages were immobile, and there was only a slight movement of the vocal cords. The mucosa of the larynx appeared stiffened and thickened. There was some edema of the arytenoid cartilages (this was probably due to the previous treatment with radium).

Roentgen therapy was instituted by Dr. M. Lenz and his staff, and marked improvement was soon noted. An examination on May 15 showed that the left nostril was patent and nasal breathing easy. There was more room between the cords, and below the cords masses could be seen extending into the lumen of the trachea. There was still some dyspnea.

In October the left nostril again became occluded, and treatment with roentgen rays was again instituted, with relief. Two months later, there was again a relapse, and roentgen treatment was again given. In January 1932, the laryngeal symptoms became so marked that a tracheotomy was considered, but with massive doses of roentgen rays the laryngeal condition improved rapidly.

The patient has been under close observation since that time. An examination on March 2, 1933, showed a slight narrowing of the vestibule of the left naris. The pharynx was clear. The cords moved slightly, and there was considerable thickening of the arytenoid cartilages. Below the cords a small mass was seen projecting into the trachea from its anterior wall. Except for a moderate hoarseness, there have been no symptoms since 1931, and the patient has been entirely comfortable.

Case 2.—M. A., a woman born in Russia, aged 42, first came under my observation in July 1924. She had been in the United States for thirty-one years. In 1912 there had been difficulty in breathing, and the diagnosis of a "growth" in the larynx was made. An operation was performed, and two days later an emergency tracheotomy was done. The patient wore the tube for four and a half years, during which time she was comfortable.

During that period treatment with roentgen rays was given, following which marked improvement occurred, and the symptoms disappeared until 1921, when marked hoarseness and dyspnea developed. The patient was told that a stricture of the larynx was forming, and dilations were performed and radium applications given. Since 1923 there had been considerable difficulty in breathing, which had progressively become worse.

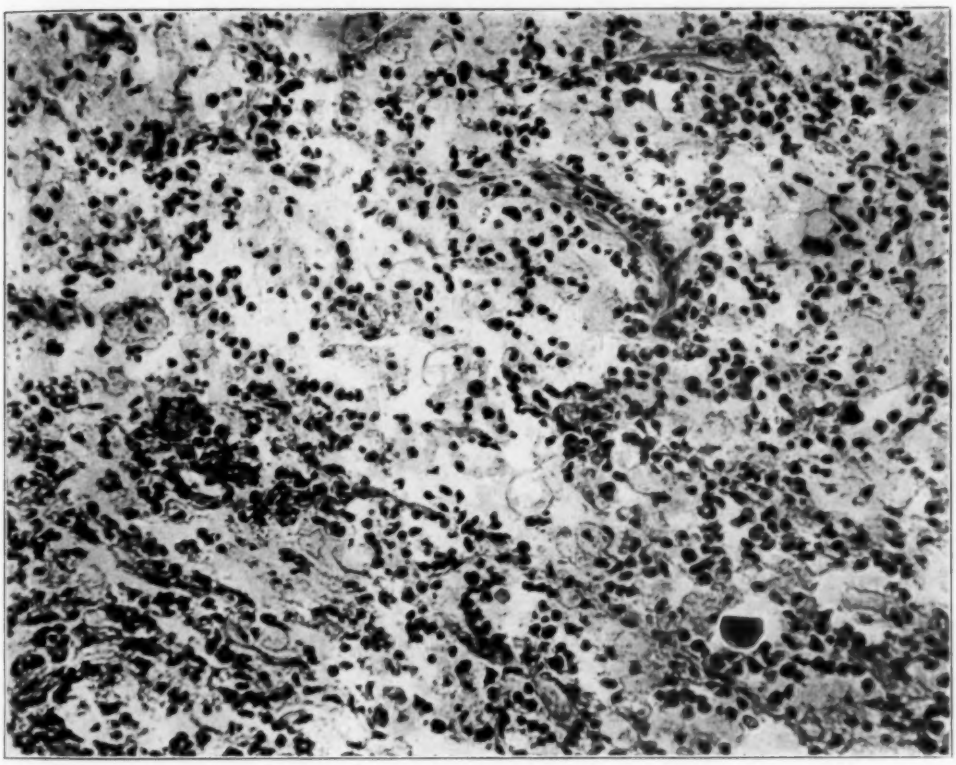
An examination on July 29, 1924, showed that the larynx above the vocal cords was markedly thickened, especially in the interarytenoid space, where a distinct mass was present. The vocal cords scarcely moved. Below the cords was a thickening of the posterior wall of the larynx. The patient was markedly dyspneic.

On Aug. 7, 1924, a direct examination was made by Dr. C. J. Imperatori. A 7 mm. tube passed the cords, but a larger tube could not be used. The web and the mass were removed with immediate relief to the patient, and a no. 32 F sound passed. Following this, sounds were passed under direct examination at regular intervals, and there was distinct improvement. Except for hoarseness the patient was without complaint until 1928.

At that time she complained of difficulty in breathing through the nose. A marked narrowing of the vestibule of the left naris had developed, and there was

a marked deflection of the septum to the left. The nose felt hardened, and the tip could not be moved. It seemed as though this sclerotic process was "pulling" the septum far over to the left side. The dyspnea was becoming more marked, and a large mass developed on the right side of the larynx. There appeared to be sufficient space between the vocal cords to permit breathing, but below the cords the trachea appeared to be very narrow.

The patient was admitted to the Montefiore Hospital for Chronic Diseases on June 6, 1930, with a diagnosis of rhinoscleroma, for a tracheotomy. The trachea was found so hardened that the scalpel was forced through into the lumen with



Photomicrograph of a section from the lesion in case 2, showing the typical lacelike appearance of rhinoscleroma.

difficulty; the laryngeal wall was over 1 inch (2.5 cm.) in thickness. Complete relief from the dyspnea followed the operation.

A pathologic examination by Dr. Perla of the tissue removed at tracheotomy showed a typical rhinoscleroma, as described by Wright.

Treatment with roentgen rays to the nose, larynx and trachea was instituted shortly afterward, with remarkable results. The nose rapidly became mobile, and the patient was able to breathe easily through the left naris. The mass in the trachea persisted. An examination on Nov. 22, 1930, showed marked improvement.

In 1931 another series of treatments with roentgen rays was given by Dr. M. Lenz, and in the latter part of 1932 the tracheotomy tube was removed.

An examination in April 1934 showed the larynx to be entirely smooth, with no masses. The cords and the larynx below the cords were thickened. There was only slight movement of the cords. The voice was good. There was a small fistula in the tracheotomy wound. The patient complained that there was occasional difficulty in breathing. The nasal septum was markedly deflected to the left, but nasal respiration was easy. Another series of treatments with roentgen rays was advised.

SUMMARY

Two cases of advanced rhinoscleroma with nasal, laryngeal and tracheal involvement are reported.

In both cases improvement followed roentgen therapy.

Neither roentgen or radium therapy should be considered a cure for scleroma. These patients must be kept under continual observation and treatment with roentgen rays must be repeated when necessary. Treatment with roentgen rays appears to be more efficacious than treatment with radium.

Except in case of urgent necessity or for securing material for biopsy, surgical intervention is contraindicated in cases of scleroma.

7 West Seventy-First Street.

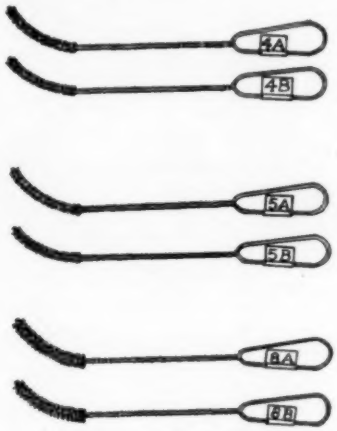
Clinical Notes

BRUSHES FOR CLEANING TRACHEOTOMY TUBES

LAWRENCE R. BOIES, M.D., MINNEAPOLIS

Any physician or nurse who has cleaned tracheotomy tubes appreciates the difficulty of ridding the lumen of the tube of tenacious mucus. The usual method has been to push cotton pledgets through with wooden or wire applicators or to use a brush, which usually does not fit the tube or has bristles which are too soft.

To overcome that difficulty I designed and had made the brushes illustrated. There are two brushes for each complete tube. The brush is numbered to correspond to the number of the tracheotomy tube. The *A* brush fits the inner tube snugly and the *B* brush the outer tube. The bristles are very stiff, being made from the heavier ends of imported boar bristles. The brush is flexible, and the curve may easily be altered. The brushes are inexpensive, and they may be obtained directly from the manufacturer.[1]



Different types of brushes.

A MODIFICATION OF THE SAUER-SLUDER GUILLOTINE

GEORGE C. SAUNDERS, M.D., PORTLAND, ORE.

Since the earliest work of the late Dr. Sluder on the removal of the tonsils by use of the guillotine there have been numerous modifications of his instrument. The purpose of most of these has been to secure greater crushing strength so that

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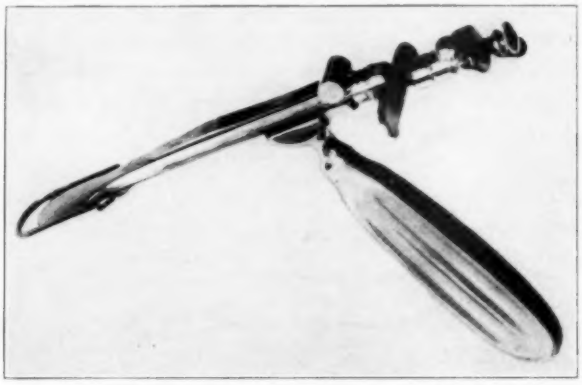
1. The brushes are made by the Flour City Brush Company, Minneapolis.

the hemostatic action of a dull blade could be utilized. One of the most successful modifications has been the Sauer-Sluder instrument, in which a thumbscrew furnishes the final crushing pressure. In my hands, as well as in the hands of several other laryngologists, this instrument has been rather awkward, because the thumb-lever is in such a position that one cannot hold the guillotine well up on the handle, as taught by Dr. Sluder. If one holds the handle far down one loses some of the control of the instrument, and if one holds it close one is unable to reach the thumb-lever without readjusting the grip. To eliminate this difficulty I have removed the long thumb-lever which projects downward and substituted a crosspiece, as shown in the picture. This crosspiece is in almost the exact position of the thumb-lever in the first Sluder instrument and in the later modification by its originator.



Sauer-Sluder guillotine as modified by the author.

The thumb-lever projects on both sides; the left projection is used when the instrument is grasped in the right hand and the right one when the left hand is employed. With this minor change the exact technic of Dr. Sluder may be followed, with the added advantage of unlimited crushing power.

This instrument has been made for me by the A. S. Aloe Co., St. Louis.

THE RIGHT ANGLE INCISION IN THE RADICAL (CALDWELL-LUC) ANTRUM OPERATION

LaFayette P. Monson, M.D., San Francisco

In 1893, Caldwell of New York[1] first described the radical operation on the antrum which has since been associated with his name. Shortly after, Spicer of

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1. Caldwell, G. W.: Disease of the Accessory Sinuses of the Nose, and an Improved Method of Treatment for Suppuration of the Maxillary Antrum, New York M. J. **58**:527 (Nov. 4) 1893.

England [2] and, still later, Luc of France,[3] working independently, each described a similar operation. Both Caldwell and Luc gained access to the anterior bony wall of the antrum by a transverse incision in the mucous membrane of the gingivolabial recess (fig. 1). Spicer used a crucial incision to reach to the anterior surface of the maxilla.

No other modifications of this incision were reported until, in 1930, Menzel of Vienna [4] recommended the use of a vertical incision in the Denker operation and a vertical oblique incision in the Caldwell-Luc operation (fig. 2). The latter incision, which has been popularized in this country by Carmody of Denver, is in the direction of the branches of the infra-orbital nerves and also of the quadratus labii superioris muscle. By this means most of the objections of the transverse method (dental anesthesias and frequent traumatic swelling and pain which may occur from too forceful retraction) are lessened or eliminated. However, when the vertical oblique incision is used, retraction of the soft tissues and adequate exposure of the bone to be removed are more difficult.

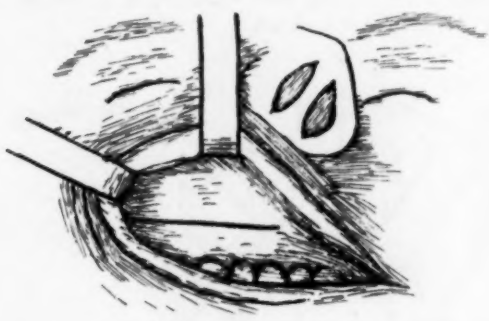

Fig. 1.—The transverse incision for the radical antrum operation; author's sketch.

For the past year or more I have been using a right-angle incision (fig. 3), which is a combination of the types just described. Whereas the classic transverse cut extends laterally from a point near the frenum to a point above the third molar tooth (from 3 to 4 cm.),[5] my incision is never longer than 2 cm. and is frequently less. I make a cut in the gingivolabial fold, beginning at a point above the canine tooth and extending laterally for approximately 2 cm. or less. From the medial end I incise upward for from 1 to 1.5 cm., making a right-angled flap. This flap is then separated from the underlying bone with a periosteal

2. Spicer, Scanes: The Surgical Treatment of Chronic Empyema of the Antrum Maxillare, Brit. M. J. **2**:1359 (Dec. 15) 1894.

3. Luc, M.: Une nouvelle méthode operatoire pour la cure radicale et rapide de l'empyème chronique du sinus maxillaire, Arch. internat. de laryng., May 1877, p. 273.

4. Menzel, K. M.: Zur Technik der Radikaloperation der chronischen Kieferhöhleneiterung. Ein Modifikation des Schleimhautschnittes, Monatschr. f. Ohrenh. **64**:318 (March) 1930.

5. Barnhill, J. F.: The Nose, Throat and Ear, New York, D. Appleton and Company, 1928, p. 137.

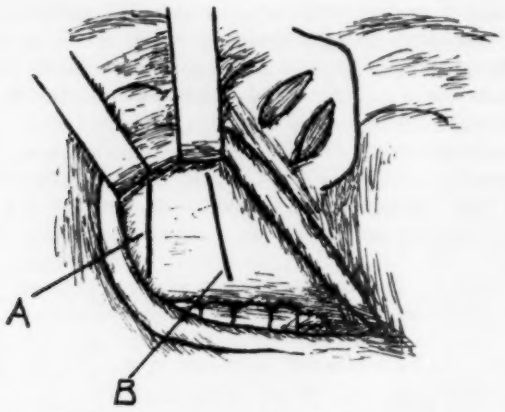

Fig. 2.—Menzel's incisions for the Caldwell-Luc operation (*A*) and for the Denker operation (*B*); author's sketch.

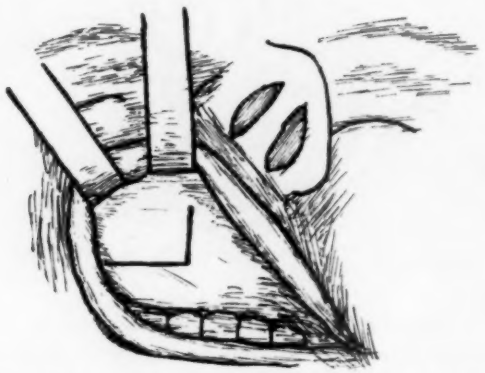

Fig. 3.—Author's right angle incision; author's sketch.

Fig. 4.—Same as figure 3, after retracting soft tissues of the cheek and making an opening into the anterior surface of the maxilla; author's sketch.

elevator and retracted laterally and upward with a broad type of retractor, such as that devised by Lowe, Hajek and Marschik (fig. 4). If this incision is used, retraction is easier; trauma and postoperative facial discomfort are less, and dental anesthesias are less common, and, if they do occur, are less extensive.

At the conclusion of the operation I use one catgut suture at the apex of the right angle incision to hold the flap in place. More sutures may be used, but I prefer to leave the remainder of the wound open for drainage.

1801 Bush Street.

Progress in Otolaryngology

Summaries of the Bibliographic Material Available in the Field of Otolaryngology

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LARYNGEAL TUBERCULOSIS

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The controversy concerning the advisability of performing a tonsillectomy on a tuberculous patient has been reopened by Newhart, Cohen and Van Winkle [1] in an article summarizing their experience at Glenlake Sanatorium. This study was begun in 1919 and is based on tonsillectomies performed on 324 tuberculous patients, including 100 children. The authors conclude that "the tuberculous patient whose progress towards recovery is hindered by pathology of the tonsils should not arbitrarily be denied the benefits of a tonsillectomy because he has tuberculosis."

They advise tonsillectomy only for those patients for whom the operation is definitely indicated and not for patients in a hopelessly advanced stage or for patients during the acute stage of tuberculosis, except in an extreme emergency. They define an emergency case as that of a patient with dysphagia, a severe irritative cough or vomiting due to pathologic tonsils. Adults should be operated on under local anesthesia and children under gas-induced ether or chloroform anesthesia. Of all the patients operated on, only 5 showed any evidence of increased pulmonary involvement.

Newhart and his associates believe that with a careful selection of patients, with the proper preoperative and postoperative care and with good surgical technic "the tuberculous patient is at least as good a surgical risk as the average ambulatory case."

Examination of the tonsils of these tuberculous patients showed an incidence of 48 per cent of tuberculous tonsillar involvement; also, that the further advanced the pulmonary disease the higher the percentage of tuberculous tonsillar disease. There was also a definite relationship between positive findings in the sputum and tuberculous tonsils. In a study of 100 routine tonsillectomies on nontuberculous patients the authors were not able to demonstrate a single case of primary tonsillar tuberculosis.

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1. Newhart, H.; Cohen, S. S., and Van Winkle, C. C.: Ann. Otol., Rhin. & Laryng. **43**:769 (Sept.) 1934.

Terry [2] does not hesitate to perform a tonsillectomy on a patient with advanced pulmonary tuberculosis if the indications are definite and clear.

Judging by my own experience with tonsillectomy on tuberculous patients, the beneficial results obtained by Newhart and his colleagues, especially the absence of subsequent advance in the pulmonary disease, are remarkable. Among 324 patients with pulmonary tuberculosis to have only 5 show an increased pulmonary tuberculosis, with or without tonsillectomy, is an achievement of which any physician might well be proud.

Notwithstanding these results, I still feel that a patient with pulmonary tuberculosis, even in its arrested form, presents an unusually poor risk as far as the bloody surgical removal of the tonsils is concerned. Of course it is conceivable that there might exist certain conditions of the tonsils which would make removal imperative, such as frequent recurrent attacks of suppurative tonsillitis. In these cases one would probably be justified in taking the risk of performing a complete tonsillectomy, but in the great majority of cases the better procedure is to remove the tonsils by less radical measures, such as electric coagulation. I have never seen any deleterious effects following cauterization or electric coagulation of the tonsils.

Rössner [3] says that tuberculosis of the tonsils is probably always a secondary infection and that the majority of authors believe the infection to be hematogenous. A lesion in the tonsil seldom can be recognized clinically and is never malignant. In Rössner's clinic histologic evidence of tuberculosis was found in 1.01 per cent of the tonsils examined. It is evident that Rössner is speaking of what is usually called primary tonsillar tuberculosis; there is no doubt that such a condition exists but that the infection originates in the mouth from infected food or drink and not from the blood stream. Secondary tonsillar tuberculosis does occur in patients with pulmonary lesions, but the incidence is a great deal higher. In practically all advanced cases of pulmonary tuberculosis tonsillar lesions can be found if a sufficiently careful histologic study is made.

Laryngeal tuberculosis in very young children has not been considered a common complication. Blumenfeld and Goebel [4] found, however, that in 89 contagious cases of pulmonary tuberculosis in children under 15 years of age there was a positively normal larynx in only 34.8 per cent; that there were suspicious lesions in 31.5 per cent;

2. Terry, George H. B.: South. M. J. **27**:626 (July) 1934.

3. Rössner, Therese: Arch. f. Ohren-, Nasen- u. Kehlkopfh. **135**:214 (July 14) 1933.

4. Blumenfeld, F., and Goebel, W.: Ztschr. f. Laryng., Rhin., Otol. **23**:267, 1932.

and frank ulcerated tuberculosis in 33.7 per cent. However, the youngest child was 8 years old. Van Poole,[5] with an experience of over thirteen years in a large sanatorium, found few cases of laryngeal tuberculosis in children under 10 years of age, but after 15 years of age the percentage of incidence of laryngeal involvement remained about the same until old age was reached. In the very old, that is, in people over 65, the complication was again rare.

Blumenfeld and Goebel found that in children the progress of the laryngeal lesion follows more closely the clinical course of the disease in the lungs than it does in the adult, whether this is toward improvement or toward progressive involvement. The lesion is most frequently found on the posterior wall of the larynx. It is usually infiltrated, and ulcers are also frequently seen on the posterior ends of the vocal cords. There are, as a rule, few clinical symptoms until just before death. Previously the prognosis was bad, from 70 to 90 per cent of the cases being fatal, but since the use of collapse therapy recovery takes place in about 50 per cent of cases. One of the reasons for the high mortality is probably the fact that local treatment is difficult and rarely tried.

Considerable discussion has recently been centered on the question of the method of the laryngeal invasion. Wessely [6] feels that in all cases in which the sputum is free from bacilli the laryngeal involvement is hematogenous and that probably invasion takes place by this method in the majority of cases.

Dobromylski [7] found that about 9 per cent of his cases of laryngeal tuberculosis occurred in patients with sputum free from bacilli and, like Wessely, feels that this involvement is probably hematogenous.

In support of the possibility of a hematogenous infection is the work by Brüggemann and Arold [8] based on a careful clinical study and postmortem examinations. The 289 patients observed at the Selters-berg Hospital were divided into two groups: the first group consisted of patients with laryngeal tuberculosis who had recognized tuberculous lesions of the lung; the second group consisted of patients in whom the symptoms of laryngeal tuberculosis developed without their having any knowledge of previous pulmonary disease. The authors believe that there was a distinct difference in the region of the larynx involved depending on the type of the pulmonary disease. When the pulmonary lesion was of a progressive bronchial type (in which one would infer that the larynx would be invaded by bacilli from the sputum), the

5. Van Poole, G. M.: Tuberculosis of the Larynx, Arch. Otolaryng. **20**:152 (Aug.) 1934.

6. Wessely, E.: Wien. med. Wchnschr. **83**:441 (April 15) 1933.

7. Dobromylski, F. I.: Ztschr. f. Hals-, Nasen- u. Ohrenh. **33**:140, 1933.

8. Brüggemann, A., and Arold, C.: Ztschr. f. Hals-, Nasen- u Ohrenh. **35**: 337, 1934.

laryngeal lesion was predominantly intrinsic, that is, situated on the vocal cords, on the ventricle bands or in the posterior wall. If, however, the pulmonary lesion was hematogenous (as was demonstrated by roentgen examination), the laryngeal lesions were extrinsic in deposition, that is, situated on the arytenoids or the epiglottis or in the pharynx or the mouth. This theory of cause and effect of the localization of the lesion is not absolute, but one usually finds that the anterior portion of the larynx is much more frequently involved in the bronchial type of infection of the lungs and that the rim or entrance of the larynx is more frequently involved in the hematogenous type. Brüggemann and Arold claim that there is an anatomic explanation for the predominance of lesions about the entrance of the larynx in a hematogenous infection, namely, the peculiar capillary arrangement around the laryngeal entrance. Here, especially in the region of the arytenoid, there is a distinct capillary plexus, but the blood vessels on the vocal cords and the posterior wall are much fewer and run in comparatively straight lines.

On the other hand, Berendes [9] believes that lymphogenous or hematogenous infections of the larynx are rare. For instance, in 8 cases of miliary tuberculosis he found no laryngeal involvement. His work was based on a careful examination of the tuberculous larynges of 16 persons who had died of pulmonary tuberculosis. Although the greater part of the mucous membrane in these specimens was so far involved by the disease as to be unfit for study in relation to etiology, he found a few areas that threw a good deal of light on the method of invasion of the mucous membrane. In areas covered by ciliated epithelium he frequently found a few tubercle bacilli surrounded by intact epithelial cells. On the other hand, unless there was some, though maybe slight, cellular desquamation, he did not find tubercle bacilli in the squamous epithelium. The epithelium itself is apt to show a lively defensive reaction to the tubercle bacillus, and there was evidence that some of the bacilli at least were destroyed by histiocytes which had wandered into the epithelium. On the other hand, the toxin elaborated by the bacilli might bring about some destruction of the epithelium which would permit the further penetration of the bacilli to the subepithelial connective tissues. However, when the bacilli gained entrance into the connective tissue, they apparently multiplied, for here they were found in large numbers. They lay in lymph spaces and were richly phagocytosed by the histiocytes.

Berendes believes that the submucosa is a particularly favorable culture medium. He has no doubt that the frequent involvement of the larynx in pulmonary tuberculosis is due to the numerous bacilli

9. Berendes, J.: Ztschr. f. Hals-, Nasen- u. Ohrenh. **33**:99, 1933.

in the sputum which in some way penetrate the epithelium and then find in the connective tissue and lymph spaces a highly favorable area for further development. He is not quite so sure that infection takes place through the mucous glands, but he has frequently found small cellular infiltrations along the ducts of these glands, especially in the ventricle of Morgagni, and these infiltrations could be traced by serial sections to typical tubercles which might lie in the neighborhood of the glands themselves, though the latter were not involved. This finding, of course, seems to indicate that an invasion can take place through the gland ducts, but in none of his cases has the author been able to find tubercle bacilli either in the ducts or in the epithelium of the glands or in this small cell infiltration which he has found around the ducts. Although the situation and relation of this infiltration to typical tubercles are suggestive of an invasion through the gland ducts, he does not feel that this has been proved.

Ricci [10] says that when one considers the enormous number of tubercle bacilli that pass through the larynx from the lung, the incidence of laryngeal involvement, from 30 to 35 per cent, is really remarkably small. He feels that in order for laryngeal inoculation to take place, there must exist in the larynx a place of least resistance, that is, some abrasion or inflammatory area in which tubercle bacilli can find lodgment and a favorable soil for development. The extent of the development depends on the resistance of the patient, a resistance which has been built up by the previous pulmonary lesion. He regards the laryngeal involvement as a sort of autoreinfection.

Spencer and Summerill,[11] being interested in the important question of the early diagnosis of laryngeal tuberculosis, made careful postmortem examinations, both gross and microscopic, of the larynges of 6 patients dying of pulmonary tuberculosis. The chief purpose of this examination was to determine whether or not an early lesion of the larynx could be detected clinically. In only 1 case was there no evidence of laryngeal tuberculosis. In 3 of the remaining cases there had been no clinical evidence that the larynx was involved but distinct lesions were found at autopsy. These lesions consisted of tubercles with typical multinuclear giant cells, and in some the tubercle bacilli were demonstrated in the tissues. In the case of a patient who had been treated by cauterization and had a healed lesion on the epiglottis, microscopic laryngeal lesions were found low on the posterior surface of the epiglottis as well as in the arytenoid.

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10. Ricci, Bruno: Valsalva **9**:417 (June) 1933.

11. Spencer, F. R., and Summerill, F.: Ann. Otol., Rhin. & Laryng. **41**:990 (Dec.) 1932.

Giuffrida [12] made a histologic examination of eighteen larynges from tuberculous patients. None of the larynges showed any macroscopic evidence of tuberculosis, but specific lesions were found microscopically in 90 per cent. The situation of these lesions in the region of the lymphoid accumulations of the laryngeal mucosa and their slow progress led the author to believe that this condition is a latent lymphoid tuberculosis undiagnosable clinically, which may be an anatomic explanation of the frequent laryngeal myopathies of the tuberculous patient.

These results are important evidence of the fact, brought out by Manassa several years ago, that tuberculosis of the larynx may be present without other subjective or objective symptoms and that it is impossible to ascertain clinically whether a larynx has been cured by treatment or not. The importance of this observation concerns not only the prognosis of the disease of any individual patient but the genesis of laryngeal tuberculosis occurring in persons who have practically recovered from pulmonary tuberculosis.

The chief argument in support of the contention that the laryngeal invasion is hematogenous relates especially to those patients in whom laryngeal tuberculosis suddenly develops although the sputum has been free from bacilli for years. The explanation is that small, undiagnosable tuberculous lesions in the larynx may lie dormant until for some reason, either because of a lessening of body resistence, as in pregnancy, or as the result of severe acute infection of the upper respiratory tract, as in some of the acute exanthems, the dormant tuberculous lesions become active.

It is difficult to believe that there may be a hematogenous involvement of the larynx, except perhaps in cases of miliary tuberculosis, and even in these the chances that the larynx may become involved are slight. For instance, in 8 cases of miliary tuberculosis reported by Berendes, none of the patients showed evidence of laryngeal tuberculosis. If the invasion was by the blood stream, one would naturally seek for the lesion not only nearer the surface but perhaps in the musculature or in some deep-lying structures. As pointed out by Manassa years ago, early laryngeal involvement is practically always subepithelial, and the deeper involvement follows from an extension of this more superficial invasion.

Heaf [13] states that as far as the prognosis of laryngeal tuberculosis is concerned the most important element is the determination of the patient's resistance. He stresses particularly the necessity of a careful examination of the blood, which gives much more important data after two of these examinations have been made a few weeks apart and while the patient is still under treatment. The continuation of a rapid

12. Giuffrida, E.: Oto-rino-laring. ital. **3**:272 (May) 1933.
13. Heaf, F. R. G.: Brit. M. J. **2**:966 (Nov. 25) 1933.

sedimentation rate, a high monocyte count and a low lymphocyte and eosinophil count which do not show any tendency to change means that the patient's resistance is poor, and so long as this state continues the laryngeal lesion will not improve.

Heaf also states that when the pulmonary lesion is fibrotic the larynx is more easily influenced by local treatment. As fibrotic pulmonary lesions are found more often in elderly people there is a high percentage of laryngeal cures in persons over 40 years of age. If the infiltration involves any part of the soft palate or fauces no response will be obtained from treatment. This statement is undoubtedly correct, and I should go even further and say that when the disease has spread from the larynx to any part of the pharynx an absolutely hopeless condition obtains but that when a lesion starts in the pharyngeal wall and there is no laryngeal involvement it is often favorably influenced by local treatment.

In order to make a positive diagnosis it sometimes may seem necessary to perform a biopsy, especially when a malignant process also is suspected. Terry, however, brings a word of warning and says that removal of material for biopsy must be avoided whenever possible if tuberculosis of the upper respiratory tract is even suspected. If, however, biopsy is necessary, removal of the tissue should be followed by cauterization of the raw surface.

Wessely sums up the essential underlying principles of the treatment of laryngeal tuberculosis and his valuation of the different methods of treatment. He says that the principle of all local treatment should be to help nature's spontaneous healing, that is, to stimulate the formation of connective tissue so that the tuberculous area may become either encapsulated or replaced by scar tissue. Further, it is essential to the obtaining of favorable results from local treatment that the patient should be in good physical condition so as to give a local reaction to the therapy of stimulation. In valuating the various methods of treatment he concludes:

1. Surgical intervention in selected cases may be used for the removal of small local infiltrations, especially those found in the posterior commissure, and at times for the partial extirpation of the epiglottis. The indication for operation, however, is seldom seen.

2. The electric cautery should be used in the treatment of extensive infiltration and ulcers with granulating surfaces when the resistance of the patient is good. By burning one obtains the greatest local reaction, which is essential for the stimulation of scar tissue; hence, this form of treatment is very valuable.

3. Electric coagulation is not so valuable as the actual cautery because of the lessened reaction and consequent formation of less connective tissue.

4. Roentgen radiation may at times be of value when used in small stimulating doses.

5. Light therapy is of great value because of its almost universal applicability. The other methods have considerable limitations to their use either because of the extent of the lesion or of its situation or because of the general condition of the patient. (Wessely uses "artificial sunlight.") The combination of long and short waves is of value because the long waves penetrate deeply while the short waves bring about rapid healing of any tissue with which they come in contact. However, in the large majority of cases, local treatment should consist of a combination of all of these methods of treatment.

Wilson,[14] in estimating the value of the various methods of treating laryngeal tuberculosis locally, says that the most important is the hygienic treatment as advised for pulmonary tuberculosis and that in favorable cases both primary and secondary lesions heal when the patient is given a regimen of rest, proper diet, fresh air, favorable climate and so forth. He considers that the galvanocautery is the most valuable measure for the local treatment of laryngeal tuberculosis and that vocal rest is essential. As far as heliotherapy (natural or artificial) is concerned, he believes that it should be used only as an adjuvant.

Underwood[15] gives a very complete review of the literature on the subject of light therapy without, however, furnishing data from any personal experience. His conclusions are quoted as they give a fairly accurate idea of what seems to be the present consensus as to the value of this type of therapy:

> It will be evident that there is unanimity neither as regards the best method of applying ultra-violet light in laryngeal cases, nor as regards the results obtained. Most writers, including even those who are ardent supporters of the method, agree that to effect a cure by light alone is often impossible, or impracticable, owing to the time and patience involved. It would seem, however, that in suitable cases, and in the hands of expert laryngologists, the method may be useful as a preparation for measures such as the galvano-cautery. Both Strandberg and Cemach insist that operative measures may be disastrous if performed too early, and they are confident that light therapy helps to raise the patient's immunity preparatory to operation. It is questionable if these advantages outweigh the fundamental disadvantage that the treatment is costly, and requires infinite patience on the part of both patient and physician.

Van Poole, after an experience of over thirteen years in large sanatoriums for tuberculous patients, says that he tried heliotherapy according to the technic of Frank Verba for about three years but discarded it because it appeared obvious that the results, if any, were largely psychologic.

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14. Wilson, G. E.: Arch. Phys. Therapy. **15**:29 (Jan.) 1934.
15. Underwood, E. A.: Brit. J. Tuberc. **27**:104 (July) 1933.

The disadvantages of the application of ultraviolet radiation to the larynx have been largely overcome by the use of a cooled quartz mercury vapor arc lamp. This was first brought to our attention by Hugo Kraus,[16] who had a lamp constructed by the Elektro-Sol Komm.-Ges., Vienna. The burner that he uses is about 13 cm. long, and the shaft is about 13 mm. thick. It consists of two tubes, one inside the other, the ends of which are bent at a rather sharp angle and somewhat widened. The end of the outer tube is closed by clear quartz glass, which transmits all the ultraviolet rays. The rest of the outside tube is made of an opal quartz glass that absorbs most of the ultraviolet rays so that radiation from the sides of the tube is prevented. This lateral radiation is further blocked by the use of a finger-cot which is perforated so that only the clear window of the end-plate is free. The lamp is shaped so that its end can be inserted into the opening of the larynx if necessary. It never gets too warm and can be kept in contact with the skin or mucous membrane for a considerable length of time. The patient is able to use this lamp very easily by means of a looking glass, and it is sufficiently light to be held for the required length of time without causing fatigue. Although the rays are similar to those from the water-cooled quartz mercury vapor arc lamp, its action is not so intensive and more time is required for each exposure. It will cause an erythema of the skin of the abdomen after a two minute contact exposure with a latent period of about two hours and lasting for about thirty days.

Although the use of roentgen radiation in the treatment of laryngeal tuberculosis has been advocated by a few as a method to hasten the formation of scar tissue, the possibility of producing both primary and secondary destructive reactions has prevented it from becoming a popular therapeutic agent.

Klestadt and Fürst [17] report in detail, both as to the clinical aspects and as to the pathologic observations, a fatal case of delayed reaction from irradiation of the larynx. However, they say that this delayed reaction which affects the larynx is always due to overdosing.

On the other hand, Zange,[18] who reports his experiences with the use of roentgen radiation in laryngeal tuberculosis for the past ten years, has not observed any serious reactions. All of his patients were carefully studied for three weeks before treatment was started, and when necessary local medication was instituted to eradicate secondary infections so that there remained only an uncomplicated laryngeal tuberculosis to be treated. His observations covered a series of about 350 cases, so that he feels able to make a judicious valuation as to both the useful-

16. Kraus, H.: Beitr. z. Klin. d. Tuberk. **81**:635 (Nov. 23) 1932.
17. Klestadt, W., and Fürst: Ztschr. f. Hals-, Nasen- u. Ohrenh. **31**:281, 1932.
18. Zange, J.: Ztschr. f. Hals-, Nasen- u. Ohrenh. **31**:308, 1932.

ness and the limitations of this method of treatment and also as to the most useful dosage. He believes that roentgen treatment is a valuable method for combating laryngeal tuberculosis and on the whole gives better results than other forms of local treatment, such as curettage or even the electric cautery. The treatment, however, is not applicable in all cases. The patients in whom the best results are obtained are those in whom the chief lesion is a productive one, not only of the larynx but of the lungs; this is true even when there is extensive and progressive pulmonary disease. If the patient has comparatively good resistance and the laryngeal lesion is covered with granulations, treatment with the roentgen rays is distinctly indicated.

Not only is it necessary to make a careful study of each patient before treatment is begun, but check-ups must be repeatedly made during the treatment so that the proper dosage and the length of time between exposures can be carefully determined. For patients with productive lesions he recommends a dosage of from 30 to 50 per cent of a unit skin dose, half of the larynx being irradiated on one day and the other half on the next day; in some cases the dosage may be raised to from 40 to 60 per cent of a unit. After this treatment there should be an interval of four, six, eight or, in some cases, even ten weeks before the treatment is resumed. The results always appear very slowly even when large doses are used, and improvement is usually noticed first after several months. The final result required may not be obtained until one or two years from the time the treatment is started.

To patients with weakened resistance and without evidence of productive or curative reaction, particularly those with greater or less evidence of an exudative process, roentgen radiation must be given with the greatest care. Even small doses, such as 10 per cent of a unit skin dose, have done harm. Also patients with perichondritis should not receive roentgen therapy, though sometimes very small doses, from 5 to 10 per cent of a unit skin doses, may aid in the relief of pain.

Bachmann and Wiegand,[19] however, prefer doses that are only stimulating and believe that roentgen treatment cannot be considered as a specific therapeutic agent. They never give more than 10 per cent of a unit skin dose and have never experienced any untoward results. They state also that irradiation of the larynx in most cases should be associated with other methods of local treatment. They have obtained excellent results and the majority were in advanced cases. They claim that the benefit of the treatment, although it varied a good deal, did not seem to hold any relation to the severity of the lesion. Sometimes patients with advanced cases showed marked improvement while those with early cases might or might not appear to be responsive. The treatments were given every five days on alternate sides, six treatments making up one

19. Bachmann and Wiegand: Ztschr. f. Hals-, Nasen- u. Ohrenh. **33**:275, 1933.

series. This series of treatments can be repeated after an interval of six or eight weeks, three or more times. In few instances was there no evidence of improvement. In very early cases there was an evident decrease in the infiltration, which afforded a much better view of the interior of the larynx so that lesions that were not previously suspected were brought into view. The authors believe that the only contraindication to the use of the roentgen rays is a persistently high fever.

Dimitry [20] gives a careful review of the use of chaulmoogra oil in the treatment of laryngeal tuberculosis. He starts with a history of this oil and its use in the treatment of leprosy and then reviews the method of its preparation and its chemistry. Especially interesting, as far as the treatment of laryngeal tuberculosis is concerned, are his quotations from Walker, Sweeney and Scholl, who have demonstrated that this oil has a specific germicidal effect on acid-fast bacilli, the bacillus of tuberculosis as well as that of leprosy. He says, however, that the dilution of chaulmoogra oil with petrolatum not only distinctly diminishes its action toward bacteria but robs it of its irritating action as far as laryngeal tuberculosis is concerned. Dimitry believes that the irritating action is probably of more value than the bactericidal action. The congestion aids in the natural healing of the lesion by fibrosis. Dimitry's explanation of the physiology of the congestion following the use of chaulmoogra oil is most interesting. It is not due to the direct action of the drug on the vessels themselves but is of the nature of a reflex effect which is conducted through the nerve supply. That is, chaulmoogra oil locally applied provokes a parasympathetic action.

We have felt for some time, that as far as drugs for local application are concerned, chaulmoogra oil is the only one that has any influence on the tuberculous disease itself, though the control of secondary infections by antiseptics is often a most important part of the local treatment. It would be worth while for those especially interested in the use of chaulmoogra oil to read Dimitry's article in the original.

Nussbaum and Tebrügge [21] claim to have obtained exceedingly good results in the treatment of tuberculosis of the mucous membrane by freezing with a mixture of carbon dioxide and acetone. Because of technical difficulties their experience was chiefly limited to tuberculosis of the mouth and pharynx though enough patients with nasal and laryngeal tuberculosis were treated to make them believe that the same results could be obtained. However, in the larynx the technical difficulties are so great that until new instruments are designed freezing of a laryngeal lesion is almost impossible.

The effect of cold on diseased tissue differs from that on normal tissue, but up to the present time there has been no plausible explanation

20. Dimitry, T. J.: Eye, Ear, Nose & Throat Monthly **12**:495 (Jan.) 1934.

21. Nussbaum, R., and Tebrügge, B.: Ztschr. f. Hals-, Nasen- u. Ohrenh. **31**: 318, 1932.

for the difference. The intensive application of cold, at least as far as tuberculous tissue is concerned, never produces a defect in the tissue, but in a short time fresh granulations appear, filling out the ulcerative areas and leading to the development of good scars. The surrounding tissue shows a moderately strong congestion, which quickly disappears. The deviation of the reaction of the pathologic tissue from that of the normal tissue requires further study; it is possible that the chronically inflamed granulation tissue of tuberculosis reacts differently from the normal tissue because of the presence of young cellular material.

Mathé [22] recognizes the fact that although some patients with laryngeal tuberculosis are relieved from pain by blocking of the superior laryngeal nerve, in a certain number of cases injections of alcohol fail completely. It has been supposed that the failure in these cases was due to the fact that the nerve was not reached by the injected alcohol, but Mathé quotes Otto Mayer, who found that in 2 of 10 cases of section of the superior laryngeal nerve the pain was not relieved. Mathé, therefore, believes that the continuation of pain after injection is not always due to a failure to reach the nerve but may be due to the fact that the diseased areas are situated in parts of the larynx not supplied by the superior laryngeal nerve. He says that the internal branch of the superior laryngeal nerve penetrates the thyrohyoid membrane and innervates the posterior surface of the epiglottis, the aditus laryngis, the mucous membrane immediately around the opening into the larynx, the recessus pyriformis and the mucous membrane of the interior of the larynx down to and including the upper surface of the vocal cords. The two positions not reached by blocking the superior laryngeal nerve are the anterior surface of the epiglottis and the subglottic areas.

Mathé, in 4 cases in which he failed to obtain relief from pain by injecting alcohol into the superior laryngeal nerve, succeeded by blocking the glossopharyngeal nerve. He avoided any interference with swallowing by blocking only one side, and no complications resulted. His technic is as follows: The posterior edge of the ascending ramus of the jaw and the anterior surface of the mastoid process are first located. A needle about 6 cm. long is inserted 1 cm. above the tip of the mastoid process. Following intimately the anterior surface of the mastoid it is pushed horizontally inward and slightly upward. The nerve should be struck at a depth of about 4 cm. By careful movement of the point of the needle pain may develop and radiate to the region of the larynx or perhaps toward the ear. When this pain is produced, 4 cc. of a 1 per cent solution of procaine hydrochloride is injected. If this injection lessens the pain in the larynx it is followed by an injection of 4 cc. of 85 per cent alcohol. The only disagreeable result that followed the injections in his cases was a burning pain at the site of the injection in some of them for

22. Mathé, K.: Ztschr. f. Hals-, Nasen- u. Ohrenh. **31**:547, 1932.

twenty-four hours after the effect of the anesthetic had worn off. Mathé does not believe there is much danger of injuring the blood vessels, though it is possible that the pneumogastric nerve might become blocked. This, however, he says would not be accompanied by any cardiac disturbances, and if there was a recurrent paralysis the immobilization of the larynx would be beneficial rather than harmful. However, in none of his 4 cases was there any complication. Bilateral blockage of the glossopharyngeal nerve should never be undertaken because of interference with swallowing.

Head [23] suggests a unique method for putting the larynx at rest when the patient does not take kindly to the use of a pad and pencil. He has improvised an artificial larynx similar to that developed by the Bell Telephone Laboratory in cases of laryngectomy, which, however, is operated by a bellows carried under the arm. He has found that this artificial method of producing a voice entirely independent of any respiratory action can be learned by the patient, though considerable practice is required. Pressure on the bellows by the arm produces a sound in the artificial larynx which is carried to the mouth by the attached rubber tube. In this way the patient talks without using either his lungs or his larynx. This is an ingenious device, but I doubt its practicability.

23. Head, J.: Am. Rev. Tuberc. **28**:445 (Oct.) 1933.

Abstracts from Current Literature

Ear

THE MENTAL HYGIENE PROBLEMS OF THE DEAF. IRA S. WILE, Arch. Pediat. **50**:603 (Sept.) 1933.

This article is a discussion of the problems of mental hygiene peculiar to the deaf. Too infrequently the deaf are regarded as persons who lack hearing, with the emphasis on the aural inadequacy. They should be regarded as persons who, because of an auditory block, are not integrated in the same biologic level as those who hear. The growth of personality in deaf persons is retarded by reason of deficiency factors in ideation. The intelligence of the deaf is measured with difficulty, and ordinary intelligence tests often suggest a mental inadequacy that is not in harmony with the facts. Wile doubts that mental deficiency is much more frequent among the deaf than among those who hear, and believes that there is a need for better methods of testing the mentality of deaf persons.

Various mental tests of the deaf are discussed and suggestions for a better handling and a better understanding of such persons advanced.

WADDELL JR., University, Va. [AM. J. DIS. CHILD.]

HEARING AIDS AND HEARING TESTS. C. S. HALLPIKE, J. Laryng. & Otol. **49**:240 (April) 1934.

Hallpike states that the method of anatomic analysis is virtually impossible in the ear and that, therefore, the only recourse is an analysis of function. Of the functional tests, the most important is that of the so-called pure tone audiogram, which bears a fairly constant, intelligible and often illuminating relationship to the complete performance of the ear in dealing with speech and forms a promising basis from which some accuracy and intelligence in the construction and prescription of hearing aids may be expected to arise. Important differences exist between the experimental conditions obtained during pure tone tests and those of listening to ordinary conversation. In listening to pure tones the stimulus is prolonged and the time factor is negligible. In listening to speech, sound waves fall on the ear in rapid succession and are not repeated, being heard or not heard once and for all. The time of action of the stimulus is of considerable importance. This has to do with what is known as the chronaxia, or time-strength relationship of a stimulus. One of the inherent defects of tuning fork tests is that the stimulus applied is one of the dying-away type. It is important to employ stimulation rising from subthreshold values. Valuable insight into overall hearing loss for speech is provided by accurate pure tone audiograms. Although other factors exist, such as the chronaxia disturbance, which still needs investigation, the pure tone audiogram remains the most valuable piece of information at one's disposal.

As a basis for the construction of hearing aids the author refers to receiving circuits with or without amplifying valves, which have a resonance corresponding to the frequency band of the deafness. Wharry introduced a method of using carbon microphones of varying degrees of hardness which had resonances in different parts of the scale; by using one or the other, or a combination of these carbons, a microphone could be produced with a resonance corresponding more or less to the area of deafness. Good results were obtainable by this method. The difficulty lies in accurate fitting of the resonances of the instrument to the areas of hearing loss. If there is a generalized loss with a small relative dip at 4,096 vibrations per minute, a carbon arrangement with a sharp peak at 4,000 vibrations will give a painful intensity at 4,000 vibrations before the neighboring frequencies are brought up to the threshold, and so one type of distortion will be replaced by another. Persons with senile types of deafness are often disturbed by traffic noise or conversation. They are often best helped by a speaking tube, which tends to

exclude all but the speaker's voice. The use of hearing aids employing bone conduction has often given disappointing results, owing possibly to the distortion resulting from varying pressure of the hand on the instrument on the skull. It is generally stated that in cases of gross defect of the tympanic membrane, such a device as a loose pledget of absorbent cotton introduced into the ear in a manner not well defined sometimes results in marked improvement of hearing. Wever and Bray discovered that when sound waves fall on an intact living ear of the mammalian type electrical oscillations are set up in the ear with a frequency corresponding to that of the sound. These oscillations can be picked up by suitable electrodes and after amplification can be heard through a loud speaker, speech itself being well reproduced in this way. In the course of investigating this phenomenon, Hughson and Crowe of Baltimore found that the strength of the oscillations was increased by inserting a small plug of cotton into the niche of the round window, pressing on the secondary tympanic membrane. They considered the strength of these oscillations to be a probable index of the animal's hearing and maintained that pressure on the membrane of the round window was a method of improving hearing.

EDITOR'S ABSTRACT.

INFLUENCE OF THE SYMPATHETIC NERVOUS SYSTEM ON THE PERIPHERAL VESTIBULAR APPARATUS AND THE DOCTRINE OF THE LABYRINTHINE FLUID. R. LEIDLER, Monatschr. f. Ohrenh. **68**:686 (June) 1934.

Leidler states that the fluid in the labyrinth must consist of a maze of currents, the resultant state of which under normal conditions is apparently associated with one of the principles of functional activity of the organ. It must be emphasized that the theory of the function of the fluid which takes currents into consideration is complicated. The idea has become prevalent that with the body at a standstill the labyrinthine fluid also becomes quiescent and that it is set in motion only by the movements of the head. This is unlikely in view of the foregoing conclusions. This theory should be regarded with the greatest distrust, especially that part dealing with its physical simplicity.

EDITOR'S ABSTRACT.

DIABETES AND PURULENT MIDDLE EAR INFECTIONS. W. UFFENORDE, Ztschr. f. Hals-, Nasen- u. Ohrenh. **35**:385 (April 6) 1934.

Uffenorde describes two cases of purulent infection of the middle ear with diabetes mellitus. The first was that of a woman, aged 53, who had suffered for many years from diabetes, asthma, rheumatic pains and sciatica. There developed pain in the ear, headache, fever, nausea, thirst and loss of appetite and of weight. The urine contained 5.8 per cent sugar and was strongly positive for acetone and diacetic acid. The blood sugar was 210 mg. per hundred cubic centimeters. Severe otitis media with increased pain of the mastoid on pressure developed without previously noticeable cold or sore throat. A bloody secretion occurred bilaterally on paracentesis. The middle ear process rapidly improved with treatment of the diabetes by insulin and diet. Even the hearing, which was almost lost, returned.

In the other case also, severe diabetes with general symptoms preceded the middle ear infection. This otitis responded similarly to diet and insulin. The author therefore concludes that internal treatment is most important.

EDITOR'S ABSTRACT.

SUPERIORITY OF THE ARTIFICIAL TYMPANIC MEMBRANE TO ARTIFICIAL HEARING APPARATUS TOGETHER WITH CRITICAL NOTATIONS ON QUANTITATIVE AUDTORY TESTING WITH THE TUNING FORKS AND THE AUDIOMETER. M. NADOLECZNY, Ztschr. f. Hals-, Nasen- u. Ohrenh. **35**:472 (April 6) 1934.

Nadoleczny has used the so-called "silver leaf" prepared with sterile petrolatum or boric acid ointment as his artificial tympanic membrane for more than twenty

years. In testing the hearing of patients with such artificially formed tympanic membranes he has been especially interested in improved hearing above C-4. In four patients for whom artificial tympanic membranes had been made, the hearing was tested before and after with the Bezold series of tuning forks and the audiometer. These tests showed that by means of the artificial tympanic membrane the important lower hearing limit sometimes sank to normal and that the deep tones were more accurately heard. They also showed with clearness a marked improvement for higher tones to at least C-6. Entirely separate from all acts of auditory testing was the change in musical hearing in one case, in which there was improvement of hearing for every high tone. The author states that the artificial tympanic membrane alone allows an improved hearing of the tones above C-4. In regard to the comparative efficacy of the Bezold-Edelmann series of tuning forks and the audiometer, no agreement can be reached. The author feels that both are highly dependent on the attention, concentration ability and intelligence of the observer. At least it can be said that it is never sufficient to test the C series alone with the audiometer, since for phonetic reasons it is also necessary to use the G series. The author concludes that the artificial tympanic membrane is far superior to any hearing apparatus if it is possible to use it. According to his opinion it can be used more frequently than is generally recognized.

EDITOR'S ABSTRACT.

HISTOLOGIC CONTRIBUTION TO QUESTION OF ORIGIN OF DEAFNESS AND INNER EAR DEGENERATION AFTER SKULL TRAUMA. O. Voss, Ztschr. f. Hals-, Nasen- u. Ohrenh. **35**:483 (April 6) 1934.

The material for Voss' contribution was obtained from a patient with complete bilateral deafness resulting from a skull injury. The patient died four weeks after the injury as a result of meningitis. Histologic examination of the left temporal bone revealed a transverse fracture which extended the entire width of the pyramid in the region of the vestibular apparatus. A long fissure extending from the tegmen to the antrum and a similar one from the geniculate ganglion to the anterior pyramidal edge with jumping out of a small three-cornered sequestrum were also found. A tearing of the walls of the sacculus and utriculus resulted from the transverse fracture, so that a single space was formed with the perilymphatic cistern. The nerve endings in the vestibule and semicircular canals showed an atrophic degeneration without admixture of blood; those of the cochlea were similar but contained blood. In the tympanic membrane there was a small perforation behind the processus brevis, and the nerves of hearing in the internal porus acusticus were torn. In the region of the basal turn of the cochlea were found the torn-out nerve fibers, and the ganglion cells belonging thereto were found in Rosenthal's canals in a state of beginning atrophic degeneration. The origin, therefore, of the deafness on this side following the accident lay in the tearing of the nerves of hearing. The endolymphatic hemorrhage caused secondary atrophy of the organ of Corti.

EDITOR'S ABSTRACT.

POSTMORTEM CHANGES OF THE INNER EAR UNDER THE INFLUENCE OF THE TEMPERATURE. C. F. WERNER, Ztschr. f. Hals-, Nasen- u. Ohrenh. **35**:564 (May) 1934.

Werner studied various aspects of the effect of postmortem variations in temperature on the inner ear of the guinea-pig. The changes observed after the same time but at different temperatures are reported. He also describes the changes in the ganglion cells and in the cochlear ganglion, in the organ of Corti, in the macula and in the crista and cupula as well as certain general features. The author concludes that the postmortem changes are entirely characteristic, run a legitimate course and are quantitatively demonstrable. The individual tissues, as for example the cell muscle, have a specific "normal reaction" and change with different speeds and character. The postmortem changes were markedly delayed by cold. The fact that human preparations are less changed than animal

preparations after the same time is clarified by the difference in temperature between the morgue and the laboratory. Postmortem cooling acts on the surviving cell as a stimulus, so that supravital changes without a stimulus in the Kubos sense do not occur. No definite differentiation between agonal and beginning postmortem changes is possible. Artificial changes are inevitable with the usual technic, so that postmortem preparations never show the exact condition present at death, but show a complicated mixture of different kinds of changes.

EDITOR'S ABSTRACT.

OTOLOGIC EXPERIENCES IN THE OBSERVATION OF BRAIN TUMORS. A. GÜTTICH, Ztschr. f. Hals-, Nasen- u. Ohrenh. **36**:78 (April 26) 1934.

Güttich discusses many of the symptoms of brain tumor, including nystagmus, hypo-excitability and hyperexcitability, dissociated nystagmus, finger pointing and past pointing. The nearer the tumor to the vestibular nucleus the more signs there are of nystagmus. The diagnosis of retrolabyrinthine disease in addition to a meningitic process is illustrated by several case reports. Retrolabyrinthine injury in the beginning is determined better by rotation than by cold stimuli. Thirty case histories of patients with tumors of the cerebellopontile angle are recorded. In most of these patients, tinnitus aurium existed. The patients who suffered from severe headaches and changes in the eyegrounds generally consulted an oculist only when visual disturbances occurred. Cerebellar signs generally developed late. Early diagnosis is much improved by recent improvement in roentgenologic technic. Spontaneous past pointing was observed twelve times. Twenty cases of cerebellar tumor are described. In eleven of these the cochlea was bilaterally normal. One patient was deaf on one side before the operation. A unilateral hearing disturbance due to inner ear damage was found twice, in both instances on the same side as the tumor. Bilateral mild hearing damage was shown by five patients. Thirteen patients had a hyperexcitable vestibular apparatus. In patients with multiple sclerosis a similar involvement of the eighth nerve was frequently found. Tumors of the brain stem behave like those of no other part of the brain. Seven of the author's nine observed patients showed a normal cochlear function. Frontal lobe tumors are in many respects difficult to differentiate from those of the temporal and parietal lobes. So-called choked labyrinth is much rarer in cases of brain tumor than choked disk except in processes primary to the eighth nerve. Of still lesser value in localizing brain tumors are rhinologic observations.

EDITOR'S ABSTRACT.

Pharynx

TONSILLECTOMY OR INCISION IN PERITONSILLAR ABSCESS? F. ZÖLLNER, Ztschr. f. Hals-, Nasen- u. Ohrenh. **35**:509 (May 15) 1934.

Zöllner attempts to answer several questions in regard to the treatment of peritonsillar abscess. The first question, whether tonsillectomy is safe in the acute stage, he answers by reviewing ninety-one cases in which tonsillectomy was performed during the acute stage. In four instances, in spite of relatively good preoperative conditions, fatal septicemia resulted. By further analysis he concludes that although tonsillectomy in the acute inflammatory stage is well borne in general, there are individual cases in which it may lead to severe complications. In regard to the question whether simple incision suffices for the healing of the acute inflammatory process, the author states that about two thirds of the patients treated in this way become rapidly fever-free. The final question asked is whether there are satisfactory indications for tonsillectomy. As a result of critical analysis of the clinical and histologic evidence available, the author feels that there are three points which serve as indications for tonsillectomy: (1) delayed involution of the local and general signs after simple incision, (2) failure of the incision to elicit pus, e. g., hidden abscess or phlegmon, and (3) septic states resulting from the tonsillar condition and also absence of demonstrable peritonsillar inflammatory signs.

EDITOR'S ABSTRACT.

SIMPLE INCISION, INCISION AND SECONDARY TONSILLECTOMY AND TONSILLECTOMY IN THE COURSE OF PERITONSILLAR ABSCESSES. A. LINCK, Ztschr. f. Laryng., Rhin., Otol. (Teil 1: Folia oto-laryng.) **25**:79, 1934.

After discussing briefly the origin, pathologic development and diagnosis of peritonsillar abscess, Linck considers the therapy of this condition. The basis for therapy consists in the discovery and emptying of every purulent peritonsillar inflammation. Healing should occur quickly and surely without leaving any abscess focus, and care should be used that not only the peritonsillar abscess but the chronically inflamed tonsils should be radically removed. Three types of operative treatment of entirely different value are considered. Simple incision is the oldest type and that most commonly employed. The advantage of this is its ease of application either by a general practitioner or in office practice. The disadvantages are well known, especially the difficulty of completely emptying the abscess. Incision followed by tonsillectomy connects the treatment of the abscess with secondary prophylaxis. The advantage of this method lies in the fact that by removing the tonsils a number of possible complications are avoided which might originate from the diseased tonsils. The disadvantages are numerous and include those which apply to incision alone. Two operative procedures are necessitated, and it is impossible to say just what is the best time for the second. Finally, the author considers immediate tonsillectomy in cases of abscess as both a curative and a prophylactic treatment. The indication for this is a purulent peritonsillar phlegmon or inflammation at any stage of development or repair. The advantages are obvious. There is no purulent peritonsillar inflammation which cannot be treated by this means. No abscess cavity exists after tonsillectomy. Disadvantages which have been advanced by opponents of this treatment include the danger of operating on acutely inflamed tissue, the special burden on severely ill patients and the risk for those with high blood pressure. The author is inclined to minimize these claims. He believes that tonsillectomy serves as a great step forward in the treatment of peritonsillar abscesses.

EDITOR'S ABSTRACT.

Nose

NASAL CILIATED EPITHELIUM, WITH ESPECIAL REFERENCE TO INFECTION AND TREATMENT. A. W. PROETZ, J. Laryng. & Otol. **49**:557 (Sept.) 1934.

Proetz points out two recently demonstrated facts of great clinical importance: 1. The normally functioning ciliated epithelium in the maxillary sinus may be, and ordinarily is, regenerated following its complete removal at operation. Thus one of the supposed contraindications to operation is eliminated. 2. The finding of living, vigorously functioning cilia in the midst of extreme hyperplasia and pus somewhat upsets the former conception of chronic sinusitis. In this communication, Proetz is primarily interested in the effects of drying, of heat and cold, of infection and of solutions used for treatment on the nature of ciliary impulses. All of his experiments were performed in parallel groups on living animals and on human membranes removed at operation. No significant discrepancies have arisen. The effects of local drying as seen in the surface views were considered especially instructive since their counterparts are produced in human noses by deviations of the septum, by spurs and by hyperplasias. Proetz feels that sudden local drying, usually in the nasopharynx, is one of the most important factors in the onset of the common cold. In his experiments, extirpated membranes were simply spread on glass tubes through which water of the desired temperature was kept flowing. Thermocouples were employed to make corrections for a slight amount of heat reaching the surface of the specimen from the illuminants. The optimum temperature for ciliary activity was found to be between 28 and 33 C. As the temperature was reduced, the motion became slower until it ceased altogether at from 7 to 12 C. Motion could be restored on warming. When the temperature was slowly raised to 43 C., all motion ceased and could not be restored on prompt cooling. One hundred and thirty observations with certain drugs were made. Three parallel

series of experiments were conducted simultaneously—on the undisturbed mucosa of the sinuses of living rabbits, on the mucosa of the human sinus principally that of the maxillary sinus, removed at operation, and on the mucosa of rabbits extirpated and treated like the human material. Each drug was applied in two ways: 1. The mucosa was immersed in the test drug for five minutes and then returned to Ringer's solution. 2. The mucosa was immersed in the test solution until activity ceased and then one or more attempts were made at resuscitation with Ringer's solution. Various dilutions of sodium chloride, liquid petrolatum, ephedrine sulphate, cocaine hydrochloride, epinephrine and some other substances were tried. Considerable variation was noted in the effects of these drugs on the ciliary action. Proetz emphasizes the fact that these experiments deal only with the rate and persistence of the ciliary beat, and that any generalization regarding relative therapeutic values may be misleading. It seems highly probable, he states, that new infection occurs through ciliated areas which are suddenly incapacitated rather than through thick, hyperplastic areas which are relatively impervious.

EDITOR'S ABSTRACT.

THE ACTION OF CILIA AND THE EFFECT OF DRUGS ON THEIR ACTIVITY. V. E. NEGUS, J. Laryng. & Otol. **49**:571 (Sept.) 1934.

Negus reviews the studies of Proetz and others on the activity of the nasal cilia, especially in relation to the effects of certain drugs. Alterations in hydrogen ion concentration play a large part in ciliary activity. He believes that considerably more work in vitro is required to confirm the changes in p_H found in cases of sinusitis, to discover the effect of the ingestion of alkali on the reaction of tissue fluids, to determine whether the paralysis of cilia is due to acids formed in the lumen of an air sinus or bronchus or in the cell itself, to corroborate or disprove the contention that it is changes of p_H which paralyze cilia and not the influence of bacterial toxins, and to decide on the best method of assisting ciliary action in the protection of the nose, sinuses and tracheobronchial tree. These factors may not be so important as the physical ones, such as drying or viscosity, but they should be considered.

EDITOR'S ABSTRACT.

NASAL FLORA AND THE REACTION OF THE NASAL MUCUS. A. R. TWEEDIE, J. Laryng. & Otol. **49**:586 (Sept.) 1934.

Tweedie has studied the p_H reaction of the nasal mucus by a colorimetric method. He summarizes his results as follows: 1. The normal nose has a reaction varying from about p_H 6.8 to 7.4 and in the majority of cases has a nonculturable bacterial content. 2. In cases of acute rhinitis, up to three days, the mucus varies in reaction from neutral to alkaline, but shows no cultural content. 3. After this period in cases of acute rhinitis, the mucus has an alkaline reaction and in most cases shows a culturable content with, generally, a more pronounced growth on an alkaline than on a neutral medium. 4. Following recovery in cases of acute rhinitis, the reaction again becomes neutral and the chances of finding a culturable content begin to diminish. 5. In cases of chronic rhinitis unaccompanied by other general symptoms, the reaction is usually neutral and the mucus more often sterile than not. 6. In cases of chronic rhinitis associated with sinusitis and the formation of polypi, the reaction may be either neutral or alkaline, and in about half the cases there is a culturable content, and growth usually occurs best on a medium with a reaction corresponding to that of the mucus. 7. In clean cases of postoperative or traumatic rhinitis, the reaction is normal and there is no culturable content. 8. A culturable bacterial content may be restricted to one side of the nose. The organisms found have been hemolytic and nonhemolytic streptococci and, occasionally, Staphylococcus aureus. He infers, therefore, that (1) the mucus of the normal nose can control pathogenic bacteria; (2) it is not until the reaction of the mucus becomes disturbed that the pathogenic bacteria can obtain a footing; (3) on the other hand, there appear to be certain noses which can be classed as carriers; (4) whatever may be the initial cause of the common cold it appears to induce

an abnormal alkaline nasal mucus; (5) with the maintenance of a healthy nose, inflammatory otitis media should be prevented; (6) in culturing, the content of the nose should be tested on both a neutral and an alkaline medium.

EDITOR'S ABSTRACT.

NASAL SUPPURATION AND LYMPHOCYTIC MENINGITIS. M. BALDENWECK, ROUÈCHE and LEVY-DEKER, Bull. Soc. de pédiat. de Paris **31**:122 (Feb. 21) 1933.

A girl, 3 years old, was admitted to the hospital because of swelling of the left ala nasi. There was a history of a fall a few days previously. The swelling increased, involving the cheek and the lower eyelid on the left side, and there was marked swelling of the interior of the nose on the left. Fluctuation developed, and incision and drainage through the nose were performed. Roentgen examination at this time revealed cloudiness of the ethmoid and frontal sinuses on the left side. The child began to show signs of meningitis. Lumbar puncture yielded a clear fluid, which was under increased pressure and which contained a slightly increased number of cells, practically all of which were lymphocytes. No bacteria were found. The Wassermann reaction of the spinal fluid was negative. The swelling of the left side of the face subsided but the temperature remained elevated. A fixation abscess was produced; this was incised and drained. No pathogenic organisms were recovered from the pus. The temperature became normal within a few days. The child recovered and showed no signs or symptoms referable to the nervous system when observed a month afterward.

BENJAMIN, Montreal, Canada. [AM. J. DIS. CHILD.]

ROENTGEN EXAMINATION OF THE ACCESSORY NASAL CAVITIES IN CARRIERS OF TRACHEAL CANNULAS. R. MENNITI-IPPOLITO, Arch. ital. di otol. **46**:617 (Sept.) 1934.

Menniti-Ippolito made roentgen examinations of the craniums of twenty-one carriers of tracheal cannulas. He found modifications in the transparency and in the development of the paranasal cavities of seventeen patients and of twenty-three healthy subjects. He believes that the changes noted may have been caused by interference with the nasal respiratory function. This complex theory concerning the paranasal sinuses is not definitely established, he feels, because of an insufficient number of observations. If further research on a larger number of patients corroborates his observations, it will prove to be important as indicating the respiratory function of the accessory nasal cavities.

EDITOR'S ABSTRACT.

ABSCESS OF THE FRONTAL LOBE OF SINUSAL ORIGIN. U. CALAMIDA and F. CARNEVALE-RICCI, Arch. ital. di otol. **46**:640 (Sept.) 1934.

Calamida and Carnevale-Ricci describe the case of a girl, aged 5, who had been successfully treated for acute ethmoiditis of the right side. The symptoms of the disease disappeared after operation. The cerebrospinal fluid showed no change. The swelling and infiltration of the right superior palpebra, evident before operation, was rapidly reduced. Within eighteen days the patient was suddenly seized by an attack of jacksonian epilepsy, preceded by a rapid rise in temperature and by general malaise. The cerebrospinal fluid gave an inflammatory reaction. The patient recovered and within a week was again subject to such an attack. This was preceded by general malaise, mental depression and nervousness. Bilateral optic neuritis was present and was accentuated on the right side. After two useless attempts at exploration of the cerebral mass, an abscess of the frontal lobe was found, localized at 2 cm. from the cerebral surface. It increased considerably in size. The abscess was drained and seemed to have been cured. Shortly after drainage of the abscess lesions of the pyramidal tract were found. These were complicated by diffuse meningitis, which was the primary cause of the death of the patient.

EDITOR'S ABSTRACT.

Occurrence of Supernumerary Concha-Like Formations in the Posterior Part of the Middle Nasal Passages. K. M. Menzel, Monatschr. f. Ohrenh. **68**:595 (May) 1934.

Menzel describes nine patients seen in the course of one and a half years in whom supernumerary concha-like bodies were seen in the posterior portion of the nasal passages. The first patient, by way of example, was a 25 year old woman in whom anterior rhinoscopy revealed a normal picture. On posterior rhinoscopy, between the normally developed posterior end of the lower right concha and the somewhat small but otherwise normal-appearing posterior end of the middle right concha, there was seen a concha-like formation arising from the lateral wall of the middle nasal passage and extending into the lumen of the passage. Its upper medial surface was convex like that of a true nasal concha, and the lower surface was concave. Its color did not differ from that of its surroundings. Fourteen human embryos of various ages were then investigated from the standpoint of development in the posterior part of the middle nasal passages. In nine of these a bilateral interturbinal roll of mucosa was observed, and in one such a roll was found on only one side. He concludes that in the majority of cases this mucosal bunch entirely disappears but that in a small number it persists and appears as an accessory concha in adult life.

Editor's Abstract.

The Relations of the Autonomic Nerve Fibers of the Nasal Mucosa to the Reticulo-Endothelium and Their Meaning for Anaphylactic Allergic Processes. L. Riegele, Ztschr. f. Hals-, Nasen- u. Ohrenh. **35**:554 (May) 1934.

In order to show the morphologic relationship between the reticulo-endothelial system and the autonomic nervous system, Riegele chose the Bielschowsky method. The observations which he details were made on specimens of formaldehyde-fixed human nasal mucosa. The cytoplasmic constituents of the connective tissue as well as of the remaining tissue were stained with hematoxylin and other stains after the gold-toned Bielschowsky preparation. Only those elements of the reticulo-endothelial system the cytoplasm of which was especially noteworthy and which were differentiated from the mesenchymal cells as well as from the fibroblasts were found to be in direct relation with the autonomic nervous terminal fibrillar network. The existing parts of the reticulo-endothelial system in the inner organs as well as in the nasal mucosa showed the same characteristics in the Bielschowsky preparation. The cytoplasm showed a changed size of its mesh and contained granules of various size, some of which were more or less plain and others even entirely unstained. The author concludes that there is a definite morphologic connection between the autonomic nerve fibers and the reticulo-endothelial system and that there is evidence indicating a functional connection also. In asthma, for example, the nasal mucosa is both the site of entry of the allergen and an affected organ, while, on the other hand, the possibility exists that in the development of allergic anaphylactic shock the so-called shock organ is far removed from the site of entry of the allergen.

Editor's Abstract.

The Sand Dust Nasal Speculum. F. H. Lorentz, Ztschr. f. Hals-, Nasen- u. Ohrenh. **35**:560 (May) 1934.

Lorentz describes a modified nasal speculum to be used for observations of nasal breathing. The previously employed speculum consisted of a somewhat heavy and flat polished metal plate, 25 cm. long and 20 cm. wide. This plate had some disadvantages, but the essential plan was retained. The author uses a somewhat smaller plate, 15 cm. wide and 20 cm. long. The graduation is also somewhat changed. He scratches into the entire plate a net with spaces of 0.25 cm. The principal objective was to find a method which would permanently and accurately retain the expiratory picture of both nostrils. For this purpose

he chose a sprinkling of sand dust on the mirror. Thus all the sand dust in the region of the nasal expiratory zone remains attached because of the condensation of water from the expiratory stream. This allows a clear and lasting expiratory picture of both nostrils. The new features of this method are the size and graduation of the plate and the spraying of sand dust. EDITOR'S ABSTRACT.

Miscellaneous

TWO CASES OF FACIAL PARALYSIS "A FRIGORE," CURED BY DECOMPRESSION. P. G. H. SANDER, J. Laryng. & Otol. **49**:503 (Aug.) 1934.

Sander states that investigations on the pathology and treatment of spontaneous paralysis of the facial nerve have not evinced satisfactory results up to the present. In this article he refers to two patients presenting facial paralysis due to exposure to cold who were cured by decompression of the nerve in the fallopian canal. He cites the work of Ballance and Duel, who favor this method of treatment. He states that a relationship between such paralysis and disease of the ear is not always existent. Ear disease must be regarded as the principal etiologic factor. The infection, however, need not be severe in order to produce paralysis. The author suggests a thorough examination of the ear in all cases.

EDITOR'S ABSTRACT.

LIPOID GRANULOMATOSIS OF BONES (HAND-SCHÜLLER-CHRISTIAN DISEASE). J. S. FRASER, J. Laryng. & Otol. **49**:666 (Oct.) 1934.

Fraser discusses various aspects of lipoid granulomatosis and describes three cases observed by Prof. John Fraser. In two cases there seemed to be no question of the diagnosis, and there was a favorable response to treatment with roentgen rays of high voltage. In one case, although in addition to exophthalmos there was a high cholesterol content of the blood, the absence of bony defects in the skull and of diabetes insipidus produced a question of the diagnosis. Pathologically, the condition appears to be due to an error in lipoid metabolism resulting in the deposit of lipoid in various parts of the body. This leads to the formation of granulation tissue with consequent decalcification and osteoporosis. Characteristic also is the presence of certain cells, evidently phagocytic, which have been called xanthoma or "foam" cells. Clinically, the disease is characterized by diabetes insipidus, exophthalmos and bony defects in the skull. Based on these features, with the addition of an excess of cholesterol and lecithin in the blood, the diagnosis is not difficult. Treatment consists in maintenance on a diet as free as possible from cholesterol and containing a large amount of green vegetables. Treatment with roentgen rays of high voltage is, however, the most important factor in successful therapy.

EDITOR'S ABSTRACT.

TWO CASES OF AGRANULOCYTOSIS IN CHILDREN. R. GANSER, Frankfurt. Ztschr. f. Path. **44**:329, 1932.

The important manifestations in these cases were hemorrhagic diathesis, enlargement of the liver and mastoiditis. Angina was present in one case. In both instances the blood showed marked reduction in the number of the red corpuscles and marked leukopenia, with relative lymphocytosis and thrombopenia. In addition, the second case revealed polychromatophilia of the red corpuscles and a moderate number of normoblasts. Several blood transfusions were given, resulting in an improvement of the blood picture. Gradually, however, the anemia and leukopenia recurred. Autopsy revealed hemorrhages into the skin, the serous and mucous membranes, the myocardium, the surface of the liver and kidneys and the subperiosteal space. In the first instance the lymph nodes in the region of the neck and hilus of the liver were moderately enlarged, while in the second case all the lymph nodes were enlarged. The mucosa covering the tonsils showed areas

of hemorrhage and necrosis. The bone marrow of the femur was dark red in both instances. Histologic examination of the bone marrow revealed an almost complete disappearance of granulocytes and megakaryocytes. Erythrocytes, erythroblasts and a large number of cells that showed only a small amount of cytoplasm were present. The nuclei of the latter varied in size. These cells resembled microlymphocytes and mesolymphocytes. Also, cells apparently identical with the hemocytoblast (stem cell) of Maximow were recognized. The lymph nodes revealed microlymphocytes, mesolymphocytes and a few macrolymphocytes and hemocytoblasts. Occasionally, eosinophilic myelocytes were also seen. The spleen contained microlymphocytes and mesolymphocytes, a few plasma cells, myelocytes and many partially destroyed erythrocytes. Small and large lymphocytes were present in the liver in addition to eosinophilic myelocytes, which were abundant in the second case. In spite of the presence of many microlymphocytes and mesolymphocytes, Ganser does not believe that these two cases are characteristic of chronic (aleukemic) lymphadenosis. He believes that these cells are closely related to the hemocytoblasts and very likely are myeloid cells. It is possible that the stem cells and their derivatives are increased in number because of a pathologic irritation. Ganser concludes that severe damage, possibly combined with a constitutional factor, produces marked destruction and necrosis of the bone marrow and may be responsible for the picture of so-called panmyelophthisis. A less severe irritation may produce atrophy of the blood-forming organs. Another type of irritation, still less severe, may cause, in addition to atrophy, regenerative and compensatory blood formations in the bone marrow and other organs. He believes that the latter explanation holds for the two cases reported.

O. Saphir, Chicago. [Arch. Path.]

Influence of Prostheses on the Mucous Membrane of the Palate. R. Greim, Monatschr. f. Ohrenh. **68**:670 (June) 1934.

Greim examined the palatal mucous membrane of twenty-six patients wearing various prostheses and found relatively typical histologic alterations in the majority of cases. These changes in the mucous membrane were desquamation of the superficial epithelial layers, cornifications of different degrees, shrinkage of connective tissue poor in nuclei, infiltration of subepithelial tissue by small round cells and degeneration of glandular tissue. Investigations of fifty-two controls not wearing prostheses showed that the changes occasioned by wearing one are slight. A summary of the reports of benign and malignant tumors in the area of the palatal mucous membrane demonstrates the relative rarity of neoplasms in that localization. On the basis of his own histologic examinations, of changes in the palatal mucous membrane reported in the literature and of a summary of the reports of new growths in the area of the gums, the author concludes that the influence of prostheses on the appearance of neoplasms in the gums must be considered slight, if such an influence is acknowledged at all.

Editor's Abstract.

Formation of Metastases in Otogenous Pyemia During Childhood. I. Hofer, Monatschr. f. Ohrenh. **68**:713 (June) 1934.

Hofer reports the cases of two girls, each aged 7, who presented otogenous pyemia with the formation of pyogenic foci in the hip joint. He states that such metastases form more frequently in chronic than in acute cases of suppuration of the middle ear or disease of the sinuses. According to the experience of numerous authors, in chronic otitic processes mainly pulmonary metastases which have an unfavorable prognosis appear, while in acute diseases of the middle ear and sinuses the more benign and prognostically favorable metastases to the soft parts and joints predominate. Metastases of this origin rarely occur in the joints of children. When they do, they are found primarily in the large joints, such as the knee, shoulder, elbow and ankle. From a number of cases, the author cites only two in which the metastases were present in the hip joint. The com-

plication was so serious in one case that it led to death. In the other, after repeated surgical intervention, a cure resulted, with partial ankylosis of the joint and shortening of the leg. If, in the course of an otogenous pyemia, despite exclusion of the primary foci in the ear and in the blood vessels, pyemic manifestations such as fever and rigor persist, metastases must be the cause of the symptoms. If local pains are manifested, such as those due to abscess formation in the skin, muscles and joints, the diagnosis is easy. The presence of pulmonary metastases, abscesses and infarcts is confirmed by roentgen examination even if they offer few symptoms. The author particularly wishes to point out the grave prognosis of metastatic foci of suppuration in the hip joint, psoas muscle and true pelvis. The metastases must be treated surgically if conservative measures are not effective. Suppuration of the hip joint must always be treated surgically and not too late.

EDITOR'S ABSTRACT.

ENCEPHALOGRAPHY AND THE EPINEPHRINE PROBE TEST FOR THE DIAGNOSIS OF BRAIN TUMOR. EICKENBUSCH, Ztschr. f. Hals-, Nasen- u. Ohrenh. **35**:533 (May 15) 1934.

Eickenbusch briefly describes and reproduces a roentgenogram for a case of glioma of the left occipital lobe. Neurologic examination in this case gave no evidence as to which side was affected. Only as a result of the epinephrine probe test of Muck was the localization established. The discovery of the ventricle on the normal side was easy, whereas the marked narrowing of the displaced ventricle would have made its localization on the involved side practically impossible. In spite of the fact that he reports a single observation only, the author believes that the practical value of the epinephrine probe test is demonstrated and that some of the complications of ventriculography may thus be avoided.

EDITOR'S ABSTRACT.

Society Transactions

GERMAN OTOLARYNGOLOGICAL SOCIETY

Wurzburg, May 17 to 19, 1934

ZEITSCHRIFT FÜR HALS-, NASEN- UND OHRENHEILKUNDE **36**: 165-315, 1934.

ABSTRACTED BY ALFRED LEWY, M.D.

OBSERVATIONS CONCERNING THE CEREBELLUM. DR. HILPERT, JENA.

The phylogeny of the cerebellum is described. This organ is part of a coordinative mechanism which automatizes and synergizes movements that originate as a psychic process which is eventually replaced by the establishment of the automatic and more rhythmic process, the latter being more economic of energy.

Afferent fibers are received from:

1. Spine, through (*a*) the dorsal lateral cerebellar tract, (*b*) the ventral lateral cerebellar tract, (*c*) the tracts from the funiculi gracilis and cuneatus; also fiber systems representing principally secondary neurons of the posterior roots.
2. Nuclei of the vestibular system, carrying equilibrial and tonus impulses.
3. Cerebrum, carrying voluntary motor impulses.
4. Midbrain over the lower olivary body, through the central bundle of the tegmentum, carrying reflex stimuli.

The cerebellum is a cerebral ganglion, i. e., neither a center of autonomic innervation nor a pure reflex organ. It operates under cerebral influence to perform higher coordination of bodily movements and is a maintenance center for the upright walk, with relation to gravity and direction in space. This function operates through a tonic correction of every movement of coordinated muscle groups.

Two groups of symptoms result from cerebellar disturbance: dyskinesia and dystonia. Under dyskinetic symptoms are cerebellar ataxia (really an asynergia) adiadokokinesis, the knee-heel test, speech defects and asthenia for coordinated movements (virtually an asynergia). The dystonic symptoms are deviation in walking, past pointing, tipping reactions, the phenomenon of pronations and postural inertia. More important as focal signs are: forced posture of the head, due to pain on straightening, resulting from irritation of the posterior roots; the side position, due to influence of the labyrinth, the healthy labyrinth usually being upward; the forward position, a symptom of involvement of the vermis cerebelli, commonly combined with the side position; tonic attacks, similar to the tonic cervical reflexes in animals.

Compensation of cerebellar function by the cerebrum, development of occlusive hydrocephalus producing distant pressure, and similarity of symptoms in lesions of the temporal and frontal lobes often make localization impossible. These difficulties are solved by ventriculography.

EXPERIENCES WITH OTONEUROLOGIC DIAGNOSIS OF TUMORS OF THE BRAIN IN VERIFIED CASES. DR. GRAHE, Frankfort-on-Main.

It is necessary to perfect the technic of examination so that one will detect the slightest deviation from the normal. In observation of nystagmus, the 20 diopter convex lenses are essential to prevent fixation by the patient. In past pointing after minimal caloric stimulation it is best to have the patient use both arms at once, with the head held backward instead of upright.

Cochlear nerve symptoms are divided into four groups: (1) those of the stem, in which all cochlear fibers are affected; (2) those of the decussation in the

medulla, where a lesion strikes only a part of the fibers; (3) those of the lateral strands, where a lesion causes principally contralateral but also some homolateral loss of hearing, especially for speech, with loss for low tones and shortening of bone conduction; (4) those of the hearing center, where the fibers again diverge, so that a lesion results in only slight and variable findings in the contralateral ear.

If the equilibrating apparatus in the eighth nerve stem is involved, the symptoms are the same as those in destruction of the labyrinth: nystagmus, not usually to the opposite side, however, but in tumors principally to the same side; past pointing, and falling and positional disturbances toward the same side. Experimentally, reduced irritability is shown. In the brain stem, if a lesion of Deiters' nucleus has occurred, nystagmic disturbances are prominent, nystagmus being rotatory toward the side of the lesion when this is caudal, horizontal to the opposite side when the lesion is in the middle, and vertical if the lesion of the nucleus is frontally located. If the posterior longitudinal bundle is affected, deviations of the eyes and pareses of the muscle may alter the response to stimulation. The past pointing is directed toward the same side in posterior lesions, toward the opposite side in anterior lesions. Through the frontal-pontile-cerebellar tract, disturbances of equilibrium are evoked, also in lesions of the anterior and middle fossae. From lesions in the posterior fossa, nystagmus, past pointing, falling and postural reactions toward the affected side are encountered, while from those in the middle and anterior fossae there are no marked nystagmic disturbances.

Fifty anatomically verified cases are described in detail, and the conclusion is reached that in spite of distant effects tests of hearing and equilibrium are of diagnostic aid in localization, but caution is required in comparing the findings of different investigators when their technic is not identical.

ARTERIOGRAPHY AND COMBINED ENCEPHALARTERIOGRAPHY IN THE DIAGNOSIS OF DISEASES OF THE BRAIN, ESPECIALLY SPACE-OCCUPYING LESIONS. DR. LOEHR and DR. JACOBI, Magdeberg.

Moniz (Portuguese) is credited with the idea, but he used a sodium bromide solution, which had to be discarded because of serious accidents. Thorium dioxide solution, the preparation thereof used for pyelography, is recommended. It is injected preferably into the internal carotid artery. This substance may also be used as a contrast medium in ventriculography. No ill effects ascribable to the drug have been observed. Forty-seven cases of tumor of the brain are cited (four being illustrated in this article) in which the diagnoses were based on obliteration, dilatation or displacement of the vessels into which this substance was injected, or on the picture of an arteriovenous aneurysm (one case), or on that of a giant cholesteatoma with abscess of the middle fossa (one case).

DISTURBANCES OF THE VESTIBULAR NERVE IN TUMORS OF THE BRAIN. DR. UNTERBERGER, Jena.

Ninety-nine tumors, 71 of which were verified by autopsy or operation, have been observed over a period of ten years, and are now reported. Reproductions of ten histologic sections are shown, together with a table undertaking to present a schema for the clinical syndrome of each type of tumor. This does not lend itself to abstracting, but it is noteworthy that excepting the pure acusticus tumor, i. e., a pure lesion of the eighth nerve, which is shown by horizontal spontaneous nystagmus to the well side, all the other lesions are manifested in various mixtures of different types of nystagmus. Only two types of lesions are definitely recognizable clinically: (1) those of the nerve stem and (2) those of the vestibular area in the brain stem. In the latter group it may be possible, in the case of an isolated lesion, to determine whether it lies caudally or orally. Lesions of the cerebrum or cerebellum produce symptoms of involvement of the labyrinth by distant pressure. Early appearance of vestibular symptoms, with absence or late appearance of cerebellar or cerebral symptoms, speaks of a lesion of the brain

stem. A pure acusticus tumor is difficult to diagnose in the absence of papilledema or involvement of other cranial nerves (fifth and seventh). Any other tumor of the cerebellopontile angle produces evidence of an involvement of both the nerve stem and the brain stem. In gradual loss of vestibular function there may be no spontaneous symptoms, and in tumors of the cerebellopontile angle turning nystagmus is not necessarily lost, so that differentiation between a lesion of the nerve stem and one of the brain stem may be difficult. Lesions of the brain stem and cerebellum also may be difficult to differentiate, as the vestibular symptoms may be the same, and dystonia and dyskinesia may be absent in cerebellar tumors.

EXPERIENCES IN THE DIAGNOSIS AND TREATMENT OF TUMORS OF THE CEREBELLUM, WING OF THE SPHENOID AND CHIASM. DR. TOENNIS, Wurzburg.

The symptomatology depends on the location and the histologic structure, and this applies also to the technic of treatment. In childhood and adolescence, the commonest tumors are the gliomas of the midcerebellar region; in middle and later life, besides the tumors of the cerebellopontile angle, the angioblastomas of the cerebellum are commonest. The characteristic syndrome is the morning headache with vomiting and stiffness of the neck or forced posture of the head, later ataxia. In childhood, 70 per cent of the tumors are in the vermis cerebelli. The differentiation from tumors of the brain stem and ventricles is made by ventriculography. The wing of the sphenoid is a favorite location for meningioma. The more outward the location the more the sylvian fissure is invaded. The more internal growths cause exophthalmos.

Tumors of the chiasm in adolescence are usually cysts of the hypophysis. In later life, adenomas of the hypophysis and suprasellar meningiomas are more common.

The question today is the diagnosis, treatment and end-result of each type of growth. Tumors of the acusticus are best handled by the Dandy-Olivecrona method of total extirpation. The mortality is under 20 per cent, and the operation gives a high degree of working ability as an end-result.

DISCUSSION OF FOREGOING PAPERS

DR. ZANGE, Jena (presenting and illustrating his "translabyrinthine" operation for tumors of the acusticus and cerebellopontile angle): The approach is through the mastoid process; the posterior surface of the pyramid is removed and the labyrinth, the internal auditory meatus, the facial and the acoustic nerve are uncovered. This suffices for tumors of the acusticus within the internal auditory meatus. For tumors of the cerebellopontile angle it is necessary to extend the bony opening farther into the occipital region and to open the cerebellar dura (the dura of the middle fossa is uncovered but not opened), whereupon the drainage of cerebrospinal fluid permits the temporal lobe to be lifted up and forward and the cerebellum backward (which has to be done carefully), and the tumor comes into view. In these cases I leave an iodoform gauze drain, which is gradually removed. I am satisfied that in tumors of the acusticus this is the operation of choice. In tumors of the cerebellopontile angle the question as to the best approach is still open.

DR. FRENZEL: In localization of lesions known to be central, qualitative tests of the nystagmus give the best information. Quantitative tests are needless in the presence of a central lesion. For instance, the loss of the quick component and the presence of an atypical nystagmus in the caloric test, with preserved cochlear function, indicate a lesion affecting the vestibular nuclei. Lesions in the region of the fourth ventricle do not easily affect the cochlear function. I have exhibited a specimen with infiltration of the striae acusticae with which there was no loss of hearing. Therefore I believe this region has nothing to do with hearing.

[Dr. Mayer, Dr. Uffenorde and Dr. Voss reported cases in which tumors of the cerebellopontile angle were operated on by the transmastoid route with opera-

tive recoveries, but with too many poor end-results, though in this respect the method was apparently equal to other methods.]

DR. GUETTICH: After a bad start, neurosurgery has achieved a high place. The results obtained by the otologic approach, which is now only in its infancy, are already at least equal to the best that the neurosurgeons are achieving in the same territory, and this method should certainly be encouraged.

PERCUSSION OF THE SKULL AND AUSCULTATION WITH TUNING FORKS A DIAGNOSTIC HELP IN INTRACRANIAL DISEASES. DR. WANNER, Munich.

Thirty years ago, in trauma of the skull, I found shortened bone conduction for a-1 and A. Experiments on skulls stuffed with various substances led to similar findings, which have also been checked in autopsies. Inner ear deafness must, of course, be excluded.

A phonendoscope is fastened to the patient's forehead. The skull is percussed from front to back and transversely, and then over the posterior fossae, which may give differences. The forks are moved in the same directions, and differences in pitch, intensity and quality are noted. The tubera frontales and parietales give normally a shortened bone conduction.

In two cases this method localized the lesions correctly after failure of the usual methods.

ANATOMY OF THE CORTEX AS A BASIS OF THE PHYSIOLOGY AND PATHOLOGY OF HEARING. DR. DE CRINIS, Graz.

A report of Heschl (no bibliography) is quoted. The temporal lobe is divided into several areas based on differentiation of their principal cell structure as demonstrated by a new staining method. Of special interest is the demonstration of Cajal acoustic cells hitherto unknown in this region. These cells are also described in the internal geniculate body and the acoustic nucleus. Thus, stepwise, the sensory (hearing) impulses are traced to the cortex, and it is through this area that the impressions are transmitted to the higher psychologic centers of consciousness.

In a case of tumor of the acoustic nerve, retrograde degeneration of the pyramidal cells and disappearance of the Koerner cells (also occurring in this region) were shown.

INVESTIGATIONS OF CENTRAL DISTURBANCES OF HEARING. DR. RUF.

In their course to the dorsal and ventral cochlear nuclei, the acoustic fibers divide into three bundles, most of the fibers of which cross and pass via the lateral tract medial to the geniculate body to the temporal lobe, widening out and ending in the transverse temporal gyrus. Cases of lesions involving the acoustic nerve are cited:

1. Tumor of the acoustic nerve on the right side, with pressure on the middle fossa: Hearing showed a concentric narrowing on the right side; hearing on the left was nearly normal.

2. Tumor of the corpora quadrigemina: There was loss of hearing for all tones, especially for high and low, with preservation of hearing for speech. The hearing was worse on the left; the tumor was somewhat toward the right.

3. Tumor of the left hemisphere, affecting principally the temporal lobe—multiple psammoma: There was deafness on both sides, especially for high tones; that on the right side was worse. Hearing for speech was good.

4. Glioma of the right occipital lobe: There was loss especially for low tones, worse on the left side.

Severe unilateral deafness speaks for tumor of the cerebellopontile angle of the same side. Moderate combined deafness affecting both sides, but more the contralateral side, suggests a lesion above the decussation.

PHYSIOLOGY AND PATHOLOGY OF THE MUCOUS MEMBRANE OF THE TRACHEA AND BRONCHI, AND THEIR CLINICAL SIGNIFICANCE (EXPERIMENTAL INVESTIGATIONS). DR. HERRMANN, Gieszen.

The physiology of the ciliated epithelium is discussed. Experiments on dogs showed that barium sulphate in powdered form in the tracheobronchial tree was completely removed in one-half hour by the action of the cilia. This was shown by repeated roentgen examinations. The animals were fully narcotized and did not cough. In other dogs, the bronchoscope was passed under narcosis, and lesions were produced in the trachea by electrocoagulation at the level of the first rib. Barium sulphate was then introduced as in the first experiments. X-ray pictures taken at the end of an hour and at ten hours showed that the barium sulphate had not passed upward beyond the lesions. Elsewhere it had been waved up and out by the cilia. The remaining barium sulphate was forming aspiration foci in the left lung, having been reaspirated, and dyspnea and edema subsequently developed. When the animals were placed with the head and chest lower than the rest of the body, most of the barium sulphate was expelled within half an hour. Animals in which edema developed and which were not so placed died.

The experiments have clinical import. One can readily see how, in tuberculosis with lesions in the trachea, the patient has poor ability to expectorate in spite of severe coughing. The bronchial complications following foreign body ulceration are also explained. The action of poisonous gases and the production of bronchopneumonia and abscess of the lung are discussed.

CLINICAL EXPERIENCE WITH THE NEW METHOD OF BUYS-FISCHER FOR EXAMINING THE VESTIBULAR APPARATUS. DR. ARSLAN, Padua.

A criticism is offered as to the variable and loose technic which has resulted in a loss of confidence in the value of otoneurologic tests for the diagnosis of intracranial conditions except tumors of the acoustic nerve. It is necessary to establish an accurate norm under given conditions and a threshold of irritability as is done in other neurologic tests before one can arrive anywhere. The Bárány method of using the postrotatory nystagmus as a test is cited. This represents the end-result of many factors, the chief being the irritation of the cupola at the end of turning. During turning there has been perrotation nystagmus, which no doubt has some influence on the postrotatory nystagmus, as has head fixation or failure thereof. The postrotatory nystagmus is also affected by optical fixation and other optical kinetic reflexes, perhaps by a window.

With the Buys-Fischer method there are always two, occasionally three, phases which are definite and follow each other (the technic is not described in this article): 1. There is the postrotatory phase, which is clearly and definitely rhythmic. 2. After a short pause during which the eyes are quiet there is a nystagmus in the opposite direction of longer duration but slower and of smaller amplitude. The turning lasts three minutes so that the perrotatory no longer influences the postrotatory nystagmus.

A long dissertation on findings under various conditions and on the details of normal variations follows, which in the absence of better knowledge of the technic cannot be abstracted. It is believed that the technic will open up new possibilities in otoneurologic diagnosis.

TREATMENT OF SUPPURATION OF THE MAXILLARY ANTRUM. DR. ECKERT-MOEBIUS, Halle.

Attention is called to the sequelae of operations involving the facial wall, including the various preturbinal operations: swelling of the soft parts, prolonged anesthesia or paresthesias, neuritis of the second branch of the fifth nerve, fistula and other pathologic conditions. A report is made of 135 operations on 115 patients, from 5 to 69 years of age, by the intranasal method, which is described in detail. Only 3 of these patients had to be operated on again. In 3 others a prolonged discharge after operation was due to associated ethmoid disease.

After local anesthesia is obtained by means of a spray followed by a tampon, a small opening is made beneath the inferior turbinate with a hand bur; the opening is enlarged with a rasp, then with a punch forceps. Occasional cases require fracturing away the inferior turbinate temporarily as a preliminary step. The inferior meatus and the operative opening (not the maxillary antrum) are plugged with a tampon of cerate-smeared gauze for twenty-four hours, after which irrigation with boric acid or solution of sodium chloride is used.

It is believed that the intranasal operation is indicated in all severe acute cases in which drainage must be mechanically established, except cases involving a foreign body or the root of a tooth, and those in which the condition has extended to the orbit, and other cases which are not cured by irrigation, including those in which there is even moderate polyposis within the antrum.

EXENTERATION OF THE ORBIT TO PREVENT THREATENING CAVERNOUS SINUS THROMBOSIS IN TONSILLOGENOUS AND DENTAL SEPSIS. DR. CLAUS, Berlin.

Uffenorde is followed in distinguishing three types of anginal sepsis: (1) hematogenous, by direct invasion of a blood vessel; (2) lymphogenous, which may extend secondarily to the veins; (3) interstitial parapharyngeal, the most common, which may extend to the veins at any point; this extension may not be macroscopic, but may be discovered on histologic examination.

Cavernous sinus thrombosis was encountered in 5 of 160 cases. In severe cases of dental or anginal sepsis, as soon as the patient has sudden definite unilateral stabbing pains in the eye, the orbit should be exenterated, without waiting for definite objective ophthalmic evidence. Waiting for such evidence is fatal. In one case of early exenteration, recovery followed. Incidentally, bimanual palpation of the tonsil region is recommended as a method of determining on which side the anginal sepsis is located when this is in question.

CHICAGO LARYNGOLOGICAL AND OTOLOGICAL SOCIETY

Nov. 5, 1934

FRANK J. NOVAK, *President, in the Chair*

MULTIPLE CARCINOMA (PATHOLOGIC SPECIMEN). FRANCIS L. LEDERER.

Mr. R. H., aged 55, married, stated that about one year ago he became hoarse, and that this condition became progressively worse. He was first seen in my clinic at the Illinois Research and Educational Hospital early in March 1934. The past history was essentially negative. Examination of the larynx revealed a marked infiltration of the left true and false cords and of the left arytenoid and aryepiglottic fold, with ulceration of these areas. Biopsy revealed a non-cornifying squamous cell carcinoma. The Wassermann and Kahn reactions were 4+.

Treatment consisted of roentgenotherapy by the Coutard method. A 10 cm. square field was used, with 200 roentgens (r) alternately to the right and left sides daily for a total of 3,800 r to each side and a total of 7,600 r to the larynx. The treatment was begun on June 5 and ended on August 2.

Early in August the patient showed some infiltration of the left aryepiglottic fold, and was then treated with 6 gold radon implants of approximately 0.36 millicuries each, with a 0.3 mm. gold wall.

On September 2 the patient presented a hard gland, visible and palpable, on the right side of the neck. This was treated with roentgenotherapy (Coutard) in a 5 cm. square field with 200 r daily, below the original field, giving a total of 2,000 r. This treatment was begun on September 12 and ended on September 22.

About the middle of October the patient began to complain of difficulty in swallowing and of coughing spells when he swallowed liquids. Direct laryngoscopy revealed a fistula which extended from the area lateral to the left arytenoid down into the larynx. A gastrostomy was advised and was performed on October 30. Six days after this operation the patient died of peritonitis.

Postmortem examination revealed the fistulous tract involving the left pyriform sinus and leading into the trachea. All the soft tissues in this area were destroyed, leaving the cartilaginous epiglottis intact. The excavated area measured 4.5 by 3 by 2.5 cm. The esophagus, at its middle third, showed the presence of squamous cell carcinoma. There were metastases in the liver.

This case is of interest because of the multiplicity of the carcinomatous lesions and the opportunity for study of an area of intense irradiation in which the malignant cells were apparently destroyed but at the cost of functioning parts. The multiplicity of lesions is of interest because it seems to be encountered more often than ever before and may be found in the same system or in organs that have a physiologic association; again it may occur in organs having no physiologic relationship. The rarer group is the one which fulfils the requirements of having a different localization, different histologic structure and distinct and separate metastases (Billroth's postulates). Of interest, also, in this case was the presence of syphilis, which ofttimes confuses a diagnostic picture and makes tissue somewhat more resistant to irradiation because of the disturbance of the local circulation. The esophageal involvement was never suspected, the results of examination with barium sulphate being negative. All of the difficulties in swallowing were attributed to the local laryngeal lesions.

MULTIPLE CARCINOMA (PRESENTATION OF PATIENT). FRANCIS L. LEDERER.

Miss A. E. K., aged 64, stated that about a year ago she began to have pain in the roof of her mouth and "fatigue of her throat muscles" when she spoke for any length of time. A few months later she began to have attacks of coughing and choking, which became progressively worse, and at the same time a slight hoarseness developed. In February 1934, a mass developed on the right side of the neck. This was removed for biopsy in April, and proved to be carcinoma. She returned to the hospital on May 16, complaining of marked difficulty in breathing. One week later a tracheotomy was performed because of sudden extreme dyspnea.

Examination of the larynx at the time of her admission to the hospital showed a massive infiltration of both arytenoids and aryepiglottic folds, more pronounced on the left side, where the pyriform sinus was also involved. The mass had a granular appearance and presented some ulcerative characteristics on the left side.

The patient had had a radical removal of the breast, including the axillary glands, in 1920. There had been no recurrence in that region. In July 1933, an enlarged gland developed over the middle third of the right clavicle. The gland was removed and found to be carcinomatous. At that time it was believed that the origin was probably from some part of the upper respiratory tract, but the exact location could not be decided.

Treatment consisted of roentgenotherapy by the Coutard method, 200 r to each side daily for a total of 2,600 r to each side and a total of 5,200 r to the larynx. This treatment was begun on May 18 and ended on June 28, 1934.

Early in July she still showed some infiltration of the left aryepiglottic fold. On July 17, 4 gold radon implants were inserted, each of approximately 0.36 millicuries, with a 0.3 mm. gold wall.

Since the patient had had a cancerous breast removed a number of years before, the general surgeons looked on the enlargement of the glands in the neck as metastatic; the laryngeal examination disclosed its true origin. The larynx at this time appears devoid of neoplastic evidence, although only time will tell what the future will be. This patient received almost the very same therapy as the patient whose organs I have demonstrated.

DISCUSSION

DR. EDWARD P. NORCROSS: Last week a necropsy was performed in a similar case at St. Luke's Hospital. The patient gave a history of having a gland removed at another hospital and of receiving roentgenotherapy. The entire interior of the larynx was a mass of necrotic tissue, which stopped definitely at the lower border of the cricoid. I will try to bring the specimen to the next meeting, for I think it is important that these cases in which massive doses of roentgenotherapy have been given should be followed.

THE PHYSIOLOGY OF THE LABYRINTH. ANDREW C. IVY (by invitation).

I have been invited to review the subject from the point of view of the physiologist and not to present new research of my own. The labyrinth is only one of the mechanisms concerned in the regulation of body posture and the elicitation of compensating and body-righting reflexes. In the paper the various reflex mechanisms concerned in the maintenance of head, ocular and body posture are outlined, including those provoked by stimulation of the labyrinth. Experiments are cited which illustrate how these various mechanisms have been demonstrated and studied. The more recent developments in the anatomy of the vestibular apparatus, for example, those concerning the circulation of the endolymph, the endolymphatic valve and the planes of the maculae, are outlined. The views of Magnus and Maxwell pertaining to the mode of excitation of the maculae are reviewed. The chief views of the mechanism of excitation of the cristae are briefly discussed. The view that the various pairs of canals are mutually cooperative during rotation is supported by most of the evidence and lends itself readily to pedagogic presentation. The generalizations of Magnus and de Klein concerning the function of the ampullae and maculae are briefly outlined. The exceptions to these generalizations are indicated; e. g., a rabbit with only one horizontal canal, one anterior vertical canal and one utriculus, all on the same side, manifests practically normal responses to rotation in all directions. The observations of Maxwell on the dogfish are cited as corollary evidence. The more recent evidence indicates that one still has much to learn in regard to how the various canals and the utriculus function in man. The importance of studying the vestibular apparatus of the monkey, and of correlating antemortem physiology with postmortem histology in man, is emphasized. A key pertaining to the direction of nystagmus is demonstrated which renders this complex subject easily remembered by the advanced medical student. Evidence indicating that the horizontal ampulla with its central connections is rather "specific" in its function as compared with the vertical canals and the utriculus is presented. However, the central connections of the labyrinth are still imperfectly understood. The experimental results bearing on the nature of nystagmus (quick component) and the central oculomotor muscle pattern are briefly presented. In conclusion, the autonomic effects of labyrinthine stimulation are outlined.

DISCUSSION

DR. ELLISON L. ROSS: This presentation by Dr. Ivy is to me, as to every one else, very stimulating. It brings to mind many factors for the first or perhaps the second time which one often forgets.

A few years ago it was thought that the physiology and anatomy of the vestibular nerve with its end-organs and central connections were well established. Based on that supposed knowledge, diagnoses were made. The frank and unconcerned neurologic surgeon uncovered the ignorance of that period.

Sensation of position and motion is one of the several fundamental functions of animal life. Errors in this are quickly fatal to the individual animal, no matter where it exists in the scale of species. Dangerous conditions cannot be avoided, and natural enemies find an easy prey where the vestibular apparatus fails. The survival of the present animal kingdom is proof that the apparatus for equilibrium is delicately connected with the majority of the functions of life and protected by inaccessibility.

Patients come to the physician complaining of dizziness. This term has a different meaning for almost every persons. It is difficult for any one to describe his own dizziness with accuracy. Many errors are present. This is easily proved by making experiments of rotation on healthy college graduates. If the sensation of direction of rotation is not recorded at the time that it is experienced, the error is so great that the data are worthless. In a large proportion of the cases, one has to depend on the word of the patient that there is a lack of equilibrium of a certain kind and extent. One has no accurate method of measuring these things. Nystagmus, past pointing, deviation of walking, disturbances of the posture and like phenomena are evidences of extreme conditions and are indirect measures of vertigo.

Russel Brain said that orientation is the integration of influences from eight sources: (1) retinas, (2) ciliary bodies, (3) muscles of the body, (4) extra-ocular muscles, (5) semicircular canals, (6) otoliths, (7) muscle and joint sensations through the cervical nerves and (8) proprioceptors of the lower limbs. He also raises the question as to why one should not have in the ear what corresponds to papilledema and retinitis in the eye.

W. S. Thacker Neville has stated that much aural vertigo is due to retention of water, and that severe diuresis relieves it.

C. F. Church has shown that vitamins relieve the hypersensitiveness of the vestibular apparatus in rats with beriberi.

S. L. Ruskin reported a case of vestibular vertigo and nausea so severe that the patient was confined to bed for days. Cocainization and, later, injections of alcohol into the sphenopalatine ganglion cured the patient.

Mr. Krassig reported 50 cases of Ménière's syndrome. He divided them into two classes. The first class included those due to syphilis in the labyrinth, circumscribed meningitis, tumors of the eighth nerve and encephalitis. There were 18 cases in this class. The second class included those in which there were catarrhal changes in the eustachian tube and middle ear. There were 32 in this group.

Sydney Scott stated that "the largest class of cases of recurrent vertigo is that in which the condition is due to inefficiency of the mechanism of the eustachian tube."

The foregoing citations are given to emphasize the indirect avenues of approach for disturbances of the vestibular apparatus.

In spite of the wonderful work that has been done, there is much labor ahead before the vestibular apparatus will be understood.

Dr. Andrew C. Ivy: Dr. Ross' opening statements remind me that I said nothing about the relation of the labyrinth to a "sense of motion." I left that out for the reason that it has caused a great deal of argument in the scientific literature. If one wishes to read some of the more interesting polemics in scientific literature, one would do well to read the older literature on this subject; e. g., the contributions of V. Cyon and his contemporaries. The experience of vertigo, or the "sense of motion," is a very complex phenomenon in which a number of highly integrated nervous mechanisms are involved. I do not believe that the mental processes which enter into the experience of vertigo are understood completely, or that the importance of the various mechanisms concerned in the elaboration of this mental, or subjective, experience can at present be accurately evaluated. That definite qualities of sensation arise when the labyrinth is stimulated is known to every one who has had the ear irrigated. The fact, however, that the feeling of vertigo becomes less intensive on repetition indicates that accessory processes are primarily concerned in the production of the sensation, and that man certainly does not depend on the labyrinth solely for his knowledge of equilibration and of movement.

Pseudocerebellar Abscess. Sherman L. Shapiro.

A man, aged 22, in the course of chronic otitis media suppurativa and circumscribed labyrinthitis contracted diffuse manifest suppurative labyrinthitis, extradural abscess of the posterior fossa and sinus thrombosis. Coincidentally with or

following operation for these complications he showed choked disks, increased pressure of the cerebrospinal fluid (determined by lumbar puncture), frontal headache, vomiting and some evidence of incoordination suggestive of right-sided cerebellar involvement. All of these symptoms disappeared in the course of four weeks, and the patient has remained perfectly well since his illness, i. e., for approximately one year.

The possibility of a latent cerebellar abscess manifesting itself at some future date cannot be excluded in this case or, for that matter, in any of the similar cases reported.

To illustrate the difficulty in diagnosis in such a case, a case of Dr. L. Benno Bernheimer's is cited, in which a girl, aged 6, contracted acute otitis media on the right side in October 1928. Following paracentesis there was a stormy course, mastoid symptoms developing about three weeks later. A simple mastoidectomy was performed. Recovery was uneventful until the eighth postoperative day, when cerebellar symptoms developed. Nine days later all symptoms had subsided, and the child left the hospital. Twenty-one months later she had scarlet fever and succumbed to complications of this disease. At necropsy a well healed cerebellar abscess was found on the right side.

DISCUSSION

DR. E. W. HAGENS: This case of Dr. Shapiro's is interesting and instructive. The diagnosis of chronic suppurative otitis media with circumscribed labyrinthitis made when he saw the patient in September was fully justified. In October, with the other findings present, he was justified in making the diagnosis of acute suppurative labyrinthitis. It is difficult to distinguish between diffuse suppurative labyrinthitis and serous labyrinthitis, but he was justified, I think, in operating on the labyrinth. There are a number of opinions in the literature, and one encounters a large number of opinions in talking to different men, as of when to operate on the labyrinth. Many men, particularly Europeans, believe that when there is a chronic cholesteatoma with the labyrinth dead, one is justified in operating on the labyrinth. They think that if this is not done there is likely to be a spreading of the infection to the brain later, and by operating on the labyrinth this complication may be forestalled. There are many differences of opinion on this point.

With the history in this case Dr. Shapiro had every reason to feel that a cerebellar abscess was present. Apparently a cerebellar abscess from the ear comes in several different ways, from the back part of the petrous pyramid, from the labyrinth and from the sigmoid sinus. He had all the sources for a cerebellar abscess, and yet he did not operate for such an abscess. That is to his credit, for he might easily have been led to operate and, as the case turned out, there was apparently no abscess there.

He also safeguarded himself in making the tentative statement that there may have been an arachnoid involvement, and that there may be a latent abscess in the cerebellum which is still undiagnosed.

The plate Dr. Shapiro presented showing the jugular foramina settles one point that might have been brought up for discussion. He found at operation a rather roomy anatomy. Trautman's triangle was rather wide and was easy to dissect. Sometimes the distance is not so wide, and in removing the bone in order to reach the posterior surface of the petrous pyramid, as in an exploration of this region, it is possible to get into the posterior canal. I have observed a case in which the posterior canal was injured, and it showed under the microscope evidence of injury to the labyrinth. There was hemorrhage into the perilymph cavities of the cochlea and into the vestibule and semicircular canals. The patient died too soon for suppuration to occur, but the case indicates what may happen when the semicircular canal is injured.

DR. SAMUEL SALINGER: I cannot with Dr. Hagens condone Dr. Shapiro's failure to explore the cerebellum. From my point of view, and in consideration of the other cases Dr. Shapiro cited, in which operation disclosed definite pathologic changes, it seems to me that with the symptoms of pressure and the progressively

increasing ataxia he had every reason to explore the cerebellar fossa, especially as he secured no relief from spinal punctures. It would have been safe to explore the extradural region, and if he had obtained no results from that procedure, he might later have explored the cerebellum. The fact that the patient recovered by no means excludes the possibility of a cisternal accumulation due to blocking of the iter which was later spontaneously relieved. I well recall hearing Bárány discuss this syndrome in his lectures twenty years ago and remember distinctly that he advised drainage in one manner or another. I am quite sure also that I saw a similar case in consultation with Dr. Lifshutz in which the patient recovered following drainage of the lateral cisterna and repeated punctures.

DR. ROLAND D. RUSSELL: I cannot follow Dr. Shapiro in all of his remarks concerning the lack of intradural involvement, and cannot agree that this patient did not have intradural involvement. I cannot explain the increased intracranial pressure on any other basis. To me increased intracranial pressure indicates intradural involvement.

DR. SHERMAN L. SHAPIRO: With respect to the point made by Dr. Hagens as to the differentiation between serous and suppurative labyrinthitis in this case, it is quite true that serous labyrinthitis could have produced the symptoms noted, namely, spontaneous nystagmus to the opposite side with loss of vestibular and cochlear function, although such a combination is unusual in this form of labyrinthine involvement. The stormy onset, however, led me to believe that a suppurative process was present, and this diagnosis was confirmed when the total loss of function in the eighth nerve persisted after the first two weeks.

As to the criticism made by Dr. Salinger—the procedure to be followed in a case of this nature is a matter of individual judgment. One will hardly undertake a cerebellar exploration lightly, particularly in a septic field. I refrained from this undertaking because the patient's general condition began to improve several days after the last operation, although the findings of intracranial pressure persisted and some cerebellar signs were present.

Dr. Russell is correct in his statement that if arachnoiditis exists this constitutes intradural involvement. What I meant by the term "without apparent intradural involvement" was "without abscess of the brain or diffuse leptomeningitis."

HEMORRHAGE IN CARCINOMA OF THE LUNG. DR. FRANCIS L. LEDERER.

J. K. was referred by the Cook County Relief to the dispensary on Sept. 7, 1934. He was a white man, aged 50, a widower, born in the United States. He was occupied as an iceman, but had previously worked in a coal mine. His past history included measles and whooping cough, but apparently no contact with tuberculosis. The onset of his illness was insidious. He had enjoyed good health until about April 1934, when he had a cough with slight expectoration. There was no frank hemorrhage, but occasionally he brought up blood-streaked sputum. He complained of weakness and a loss of weight (30 pounds [13.6 Kg.] within one year). His usual weight was 170 pounds (77.1 Kg.); his present weight was 140 pounds (63.5 Kg.). There was no fever, night sweats or pain in the chest. His appetite was good, and the bowel movements were regular. He had no dyspnea and no chills. His nutrition was fair. He had a few decayed teeth. The heart was normal. There was impaired resonance, and the breath sounds were diminished in the upper lobe of the right lung. The urine was normal except for 100 mg. of albumin. The sputum was repeatedly negative for tubercle bacilli. A roentgenogram taken on September 19 showed a mass off the right hilus extending downward. A tentative diagnosis of bronchiogenic carcinoma of the right lung was made.

Bronchoscopic Observations.—The patient was referred to the Municipal Tuberculosis Sanitarium for bronchoscopic examination on September 27. He was admitted at 9:45 a. m., and at 10:30 a. m. was given sodium amytal, 3 grains

(0.2 Gm.). At 3 p. m. he was given morphine sulphate, ¼ grain (0.016 Gm.). The pharynx and larynx were anesthetized with cocaine topically. The bronchoscope showed a decided widening of the carina. The orifice of the right bronchus was almost stenotic, being slitlike in a vertical direction. The irregularity was seen to come from the area of the hilus, which produced a nipple-like protrusion into the lumen. The bronchus was stenotic 3 cm. beyond the orifice; no attempt was made to inspect farther. A biopsy specimen was taken from the region of the carina. The area felt very firm, and no unusual bleeding followed. As the tube was being removed and just as the patient was about to sit up, there was a gush of frothy bright red blood. Reintroduction of the tube for suction and tamponage was impossible because the flow was so great. Heroic measures of resuscitation were unavailing, and the patient succumbed in five minutes.

Postmortem Observations (Dr. Louis Parmacek).—The diaphragm, on the right, was at the sixth rib; on the left, at the seventh rib. There was a focal fibrous adhesion between the upper lobe of the right lung and the wall of the chest. The lungs were removed in toto attached to the trachea by their respective bronchi. Over the middle lobe and the adjacent portion of the upper lobe of the right lung was a palm-sized fibrous white plaque, irregular, poorly demarcated and glistening. Near its upper part, a few fibrous focal adhesions to the parietal pleura were seen. On attempting to inflate the lungs with air through a tube attached to the trachea, it was noted that the right lung failed to expand because air escaped from the upper right pulmonary vein. Only when this vein was clamped off did the right lung expand. The lungs were roentgenographed and fixed in solution of formaldehyde. Dissection after fixation disclosed the following conditions:

The trachea and stem bronchi contained much liquid and clotted blood. In the mucosa of the inferior medial wall of the right stem bronchus, near the origin of the first hyparterial ramus to the middle lobe, was a defect, 3 by 3 mm. and 2 mm. deep. Microscopic sections of the tissue from this site showed normal mucosa and fragments of cartilage, with no evidence of malignant growth. The middle lobe was firm, collapsed and subcrepitant. Section through its hilar portion revealed a chestnut-sized, irregular, infiltrating, grayish, centrally softened mass surrounding and destroying the bronchus. A few similar satellite areas were seen. Several cavities, 2 by 1 cm., saccular, thin-walled and smoothly lined, were also noted. The intermediate pulmonary tissue was inelastic. The right upper pulmonary vein, about 1 cm. from its points of penetration into the pericardial sac, presented in its superior dorsal wall an irregular tear, 4 by 3 cm., communicating with the tumor. Microscopic sections from the tissue in this area and from the lymph glands showed squamous cell carcinoma without horn pearl formation.

From the findings one may reconstruct the sequence of events: The carcinoma was extending and softening. This extension involved the wall of the pulmonary vein, which became weakened. Under the added intravenous pressure from the strain of the presence of the bronchoscope, the weakened venous wall ruptured into the softened tumor surrounding the bronchus. A massive hemorrhage from the pulmonary vein into the bronchial tree was the result. The taking of the specimen for biopsy was in no way directly related to the hemorrhage, which may well have followed severe coughing in the near future.

The liver weighed 1,330 Gm., and was smooth, deep brown and firm. On the posterior surface of the left lobe a node the size of a golf ball protruded. On cut section, a central well demarcated liquefied gray mass, 3 cm. in extent, was seen. On the posterior aspect of the right lobe a similar firm node, 1.5 cm. in diameter, was observed. A 3 cm. node was found near the one first mentioned. The hepatic substance was deep brown. The markings were indistinct. The sections taken from these areas likewise showed squamous cell carcinoma. The findings in the other organs revealed no related pathologic change or metastatic extension.

This experience, coupled with the proliferative and ulcerative changes found on postmortem examination of these pulmonary lesions, is cause for believing that similar fatalities have occurred before and may do so again. The mechanical effort of a bronchoscopic observation, though performed under the best conditions, may

be sufficient to provoke a hemorrhage from a vessel the walls of which are near a malignant mass and are perhaps even invaded by the neoplasm. There can be no question as to the advisability of the bronchoscopic procedure, but it is well to bear in mind the possibility of hemorrhage.

DISCUSSION

DR. SAMUEL SALINGER: This outcome was unfortunate, regrettable and probably unavoidable. I am glad I cannot duplicate this experience, but I may later take Dr. Lederer aside and tell him of the time I pushed a probe through the sphenoid sinus into the cranial cavity! As a matter of practical experience, the taking of biopsy specimens from the tracheobronchial tree is seldom attended by hemorrhage provided one bites into definitely pathologic tissue. Jackson says, "In peribronchial probably malignant disease, no matter how characteristic the deflection and deformity of the bronchial lumen, it has seemed unwise to bite through normal mucosa in an effort to obtain neoplastic tissue. Future investigations may show us to be too conservative, but we feel that it is due to following this rule that we have not had any ill result from the removal of a specimen of tissue in any case." Further contraindications mentioned are aneurysm, tuberculosis and active syphilis. In this case of Dr. Lederer's there was no true aneurysm. There may have been a false aneurysm, but neither the history nor roentgenograms gave any clue to its existence. He had every reason to expect a carcinoma and was justified in taking a specimen for biopsy. The only question in my mind, and this is not derogatory in any sense of the word, is whether the manipulation contributed to the hemorrhage or whether it would have occurred anyway. I believe that inevitably there would have been a spontaneous hemorrhage. The specimen shows that there was a false aneurysm. This unfortunate experience is not going to deter laryngologists from obtaining tissue for biopsy in every suspected case. It is reasonable to expect that in rare instances similar accidents may occur. The important things to remember are that one cannot expect to have a positive biopsy in every case, and that there are a few definite contraindications to the procedure. Jackson's statement that the growth is endobronchial in 85 per cent of all cases I believe is not borne out in other statistics, from continental sources. There are many cases in which the growth originates in the finer bronchioles or develops entirely in the parenchyma. Dr. Lederer's case, though tragic, was extremely instructive and will unquestionably serve to make one cautious when one is called on in the future to make biopsies.

DR. T. C. GALLOWAY: In a case a fatal hemorrhage followed removal of tissue for biopsy in carcinoma of the lung. The carina of the bronchus of the lower lobe of the right lung was widened, and granulations were present medial to the carina. A Jackson punch forceps was used on the granular mass. Immediately the light was obscured so that, in spite of suction, further work had to be done blindly. After a short delay, a one-half inch (1.27 cm.) gauze strip was packed down the bronchoscope, and at autopsy this was found to have controlled the bleeding, which came from a small vein held open in the fibrotic cancer mass. By the time the blood from the bronchi could be aspirated, the patient was past resuscitation. A proximally lighted bronchoscope might have permitted immediate control of the bleeding.

DR. HARRY L. POLLOCK: I have no personal confession, but last year at just about this time when I was at the Massachusetts General Hospital I was fortunate enough to witness a necropsy in much the same type of case. A man, aged about 55, had entered the hospital because he was troubled with difficult breathing. The attending physicians suspected trouble with the lung, and the day before I arrived had passed a bronchoscope for diagnostic purposes. They did not suspect carcinoma. Immediately on putting in the bronchoscope it fell into a cavity and at once filled up with blood. Within two or three minutes the patient was dead. At necropsy the following morning they found a large carcinoma around the right bronchus which had buried itself in the vein. There was no question but that

the bronchoscopy had caused the hemorrhage, but they felt that within a short time hemorrhage would have occurred spontaneously. I have not seen this case reported, and I think such cases are often not reported for evident reasons. I think that Dr. Lederer should be congratulated for having the courage to recount the details of this case, for one does not often see failures reported.

DR. FRANCIS L. LEDERER: If you wish a report on other experiences which you term failures, you will have to give me an entire evening. Unfortunately, I have had many of them, but I hope you understand that the point in this presentation is to call attention to a possibility in this type of pulmonary disease. My associates and I are deliberate in our biopsies and, as I brought out in the paper, anticipating possibilities is a very good thing. I think I shall never be too certain of my technic and am not excusing it, but I rather think that it was the bronchoscopic effort that was responsible, although the surgical pathologist was kind and tried to explain it purely on the basis of the underlying pathologic changes. It will be granted that when a patient is sent to one with some obscure pulmonary findings, the possibility of a malignant tumor must be considered. In the light of the spontaneous hemorrhages and those induced by bronchoscopy, I am sure one will hesitate before telling the patient that bronchoscopy is purely a diagnostic procedure, because as such it should carry no possibility of a fatality.

I find in my own experience that hemoptysis is one of the most common symptoms of bronchiogenic carcinoma, and yet from the literature and the study of the histories of cases which have been confirmed at necropsy it does not seem to be so common. In many cases that are diagnosed as carcinoma of the bronchus by bronchoscopy one does not get a positive biopsy specimen, and without a necropsy there is no way of determining whether the patient had that disease or not. Therefore, those who are in institutions are particularly fortunate in being able to confirm at necropsy the cases in which the findings are looked on as characteristic of carcinoma of the lung.

Directory of Otolaryngologic Societies *

FOREIGN

Collegium Oto-Rhino-Laryngologicum Amicitiæ Sacrum

President: Prof. Gunnar Holmgren, Karolinska Mediko Kirurgiska Institut, Stockholm, Sweden.
Secretary: Prof. Dr. C. E. Benjamins, Verlengde Heereweg, 143, Groningen, The Netherlands.

NATIONAL

American Medical Association, Scientific Assembly, Section on Laryngology, Otology and Rhinology

Chairman: Dr. John J. Shea, 1918 Madison Ave., Memphis, Tenn.
Secretary: Dr. Gordon B. New, Mayo Clinic, Rochester, Minn.
Place: Atlantic City, N. J. Time: June 10-14, 1935.

American Academy of Ophthalmology and Otolaryngology

President: Dr. J. M. Wheeler, 30 W. 59th St., New York.
President-Elect: Dr. Wells P. Eagleton, 15 Lombardy St., Newark, N. J.
Executive Secretary: Dr. William P. Wherry, 1500 Medical Arts Bldg., Omaha.
Place: Cincinnati. Time: Sept. 16-20, 1935.

American Bronchoscopic Society

President: Dr. Henryq Hall Forbes, 40 E. 61st St., New York.
Secretary: Dr. Lyman Richards, 319 Longwood Ave., Boston.
Place: Toronto, Canada. Time: June 1.

American Laryngological Association

President: Dr. Dunbar Roy, 113 N. Pryor St., Atlanta, Ga.
Secretary: Dr. W. V. Mullin, 9204 Euclid Ave., Cleveland.
Place: Toronto, Canada. Time: May 29-31.

American Laryngological, Rhinological and Otological Society, Inc.

President: Dr. Perry G. Goldsmith, 170 St. George St., Toronto, Canada.
Secretary: Dr. R. L. Loughran, Sharon, Conn.
Place: Toronto, Canada. Time: June 3-5.

SECTIONS:

Eastern.—Chairman: Dr. Frederick T. Hill, Professional Bldg., Waterville, Maine.
Southern.—Chairman: Dr. Beverly R. Kennon, Medical Arts Bldg., Norfolk, Va.
Middle.—Chairman: Dr. Daniel W. Layman, Medical Arts Bldg., Indianapolis.
Mid-Western.—Chairman: Dr. Edward H. Cary, Medical Arts Bldg., Dallas, Texas.
Western.—Chairman: Dr. Frank A. Burton, Bank of America Bldg., San Diego, Calif.

American Otological Society

President: Dr. S. J. Crowe, Johns Hopkins Hospital, Baltimore.
Secretary: Dr. Thomas J. Harris, 104 E. 40th St., New York.
Place: Toronto, Canada. Time: May 27-29.

* Secretaries of societies are requested to furnish the information necessary to keep this list up to date.